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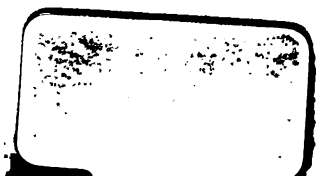
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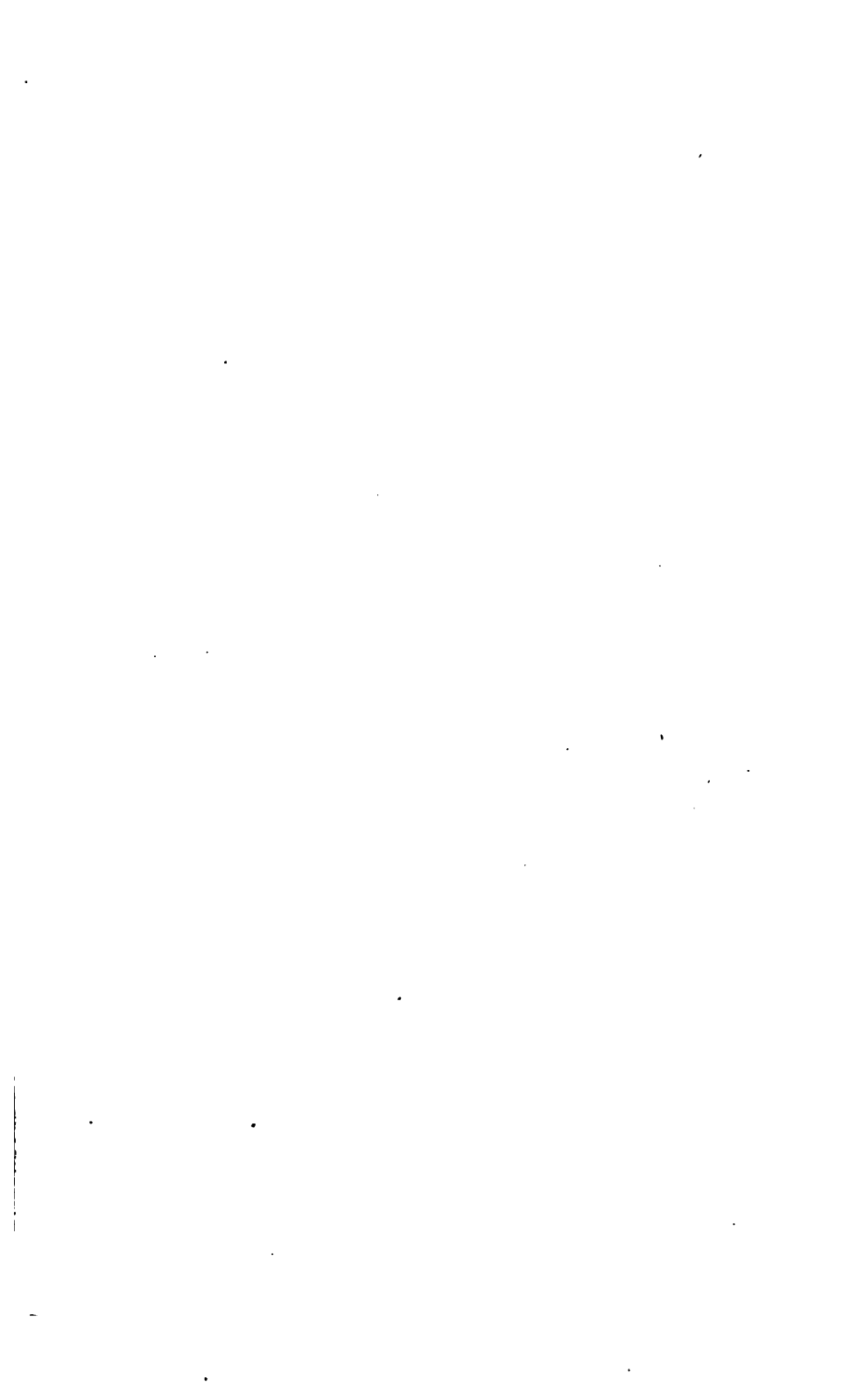
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MEMOIRS
OF
THE LIFE
OF
SIR HUMPHRY DAVY, BART.

VOL. II.

LONDON :
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M E M O I R S
OF
THE LIFE
OF
SIR HUMPHRY DAVY, BART.
LL. D. F. R. S.

FOREIGN ASSOCIATE OF THE INSTITUTE OF FRANCE, &c.

BY
HIS BROTHER,
JOHN DAVY, M.D. F.R.S. &c.

IN TWO VOLUMES.

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"Vita enim mortuorum in memoria vivorum est posita." — Cic. *Philipp.* ix.

"The affections are their own justification. The Light of Love in our Hearts is a satisfactory evidence that there is a body of worth in the minds of our friends or kindred, whence that Light has proceeded."

WORDSWORTH, *Essay upon Epitaphs.*



CONTENTS

OF

THE SECOND VOLUME.

CHAPTER I.

Researches on Fire-damp. — Discovery of a Safety Lamp. — Different Forms of this Lamp. — Extracts from Communications relative to the Use of the Lamp. — Mr. Playfair's Observations on it. — Researches on Flame. — Public Dinner at Newcastle. — Present of Plate in acknowledgment of the Benefit of the Safety Lamp. — Is created Baronet. — Letters from Mr. Buddle, vindicating, after long Trial, the Value of the Safety Lamp.

Page 1

CHAPTER II.

Further Chemical Researches. — Letters to his Mother. — Extracts from his Note-books, Philosophical, Religious, and Political. — Remarks on them. — A Specimen of his Philosophical Poetry.

- - - - - 61

CHAPTER III.

His second Journey on the Continent. — Notices respecting it. — Observations on the Formation of Mists. — Extracts from his Journal of an Excursion into the Tyrol. — Verses written at the Baths of Lucca. — Experiments on unrolling the Herculeum MSS. — Fragment of a Dialogue descriptive of an Eruption of Vesuvius. — His Researches at Vesuvius. — Opinion concerning the Nature of Volcanic Action. — Notice of Sir Joseph Banks, whom he succeeds as President of the Royal Society. — Particulars of him in connection with this Appointment. — Observations on the Office.

- - - - - 97

CHAPTER IV.

Letters to his Brother.—Researches on Electro-Magnetism.—
 Letter to his Mother.—Extract from Note-book expressive of
 State of Mind.—Further Researches on Electro-Magnetism.—
 Excursion to Ireland.—Experiments on the Electrical Phenomena exhibited *in vacuo*.—His last Visit to his Native Place.
 —Letter to his Friend Mr. Poole.—Researches on the Fluids in the Cavities of Crystalline Minerals.—Letter to his Brother from Scotland.—Verses entitled “The Eagles.”—A new Phenomenon of Electro-Magnetism.—His Suggestion to Mr. Faraday, which led to the Discovery of the Liquefaction of many of the Gases.—Proposal for their Application as Mechanical Powers.—His Rights on the Subject vindicated.—Letter to Mr. Edmund Davy from Scotland.—Letter to his Brother.—Verses on Lord Byron whilst living.—Verses on him after his Death.—Verses written at Ashburnham Place - - - - - Page 139

CHAPTER V.

Researches on the Corrosion of the Copper Sheathing of Ships, and on its Prevention.—His last Bakerian Lecture “on the Relation of Electrical and Chemical Changes.”—Journal of an Excursion to Norway and Sweden.—Verses written at Copenhagen.—Notices of Berzelius, Oersted, Gauss, Schumacher.—Verses written at Ulswater.—Letter to his Sister.—Paralytic Attack.—Notices of a Journey through France into Italy.—Verses written at Ravenna. - - - 171

CHAPTER VI.

His Occupations at Ravenna.—Pursuits in Natural History.—Extracts from Note-books.—Extracts from his Journal through Southern Austria.—Verses “on the Fall of the Traun.”—Part of a Letter to Mr. Gilbert, resigning the Office of President of the Royal Society.—Continuation of Journal.—Returns to England.—Occupations in his valetudinary State.—Notices of his Dialogues entitled “Salmonia, or Days of Fly-fishing.”—Character of his Friend Dr. Babington.—Extracts from Salmonia. - - - - - 232

CHAPTER VII.

Revisits the Continent. — Extracts from his Journal. — Letters to his Brother from Aussee in Styria, and from Ischl. — Extracts from his Journal in continuation. — “The last of the O’Donoghues,” an Irish Story, written at Wurzen. — Letter to his Brother from Laybach. — Experiments on the Torpedo at Trieste. — Letters from Rome. — Occupations there. — Note on the British Museum, with Suggestions for its Improvement. — Sudden Attack of dangerous Illness. — Letters written from his Dictation. — Particulars of him during his Illness. — Notices of little Excursions with him in the Neighbourhood of Rome. — Journey from Rome to Geneva. — His Notice of Dr. Thomas Young. — The Close of his Life. — Public Funeral. — Conjectures respecting his Malady. - - - Page 306

CHAPTER VIII.

His Posthumous Work, “Consolations in Travel, or Last Days of a Philosopher.” — Notices respecting it. — Description of remarkable Dreams. — Fragment of a Vision. — Particulars of his Person, Disposition, and Habits. — Letters of his to the late Mr. Coleridge. — Portraits of him. — Letter from Mr. Poole referring to one. — Letter from the same Gentleman on his Character generally. — Concluding Remarks. — Lines on him by Mr. Sotheby. - - - 369

MEMOIRS
OF
THE LIFE
OF
SIR HUMPHRY DAVY.

CHAPTER I.

RESEARCHES ON FIRE-DAMP. — DISCOVERY OF A SAFETY LAMP. — DIFFERENT FORMS OF THIS LAMP. — EXTRACTS FROM COMMUNICATIONS RELATIVE TO THE USE OF THE LAMP. — MR. PLAYFAIR'S OBSERVATIONS ON IT. — RESEARCHES ON FLAME. — PUBLIC DINNER AT NEWCASTLE. — PRESENT OF PLATE IN ACKNOWLEDGMENT OF THE BENEFIT OF THE SAFETY LAMP. — IS CREATED BARONET. — LETTERS FROM MR. BUDDLE, VINDICATING, AFTER LONG TRIAL, THE VALUE OF THE SAFETY LAMP.

Soon after my brother's return from the Continent he entered upon a new train of inquiry, — the investigation of fire-damp, with a view to the protection of the mines in which it occurs, and the workmen who are exposed to its destructive agency; — objects of the first importance in relation to the interests of humanity, and hardly less so as regards national wealth, and which were completely accomplished by his well-known discovery of the safety lamp.

He first published the results of the investigation in the "Philosophical Transactions," in a series of papers, which rapidly succeeded each other, and which were communicated to the Royal Society with-

out hesitation or delay, without any mystery or concealment, and in the simplest and least ostentatious manner possible. When he had brought the inquiry to a certain close, he wrote a connected account of all his labours on fire-damp and flame. The work was entitled, "On the Safety Lamp, for preventing Explosions in Mines, Houses lighted by Gas, Spirit Warehouses, and Magazines in Ships, &c.; with some Remarks on Flame," — "with the hope (as he states in the preface) of presenting a permanent record on this important subject to the practical miner, and of enabling the friends of humanity to estimate and apply those resources of science, by which a great and permanently existing evil may be subdued." He adds, "I have given the extracts from my papers nearly in the order in which they were published, which will, I hope, both render the facts more intelligible, and show the gradual progress of the inquiry, in which every step was furnished by experiment and induction, in which nothing can be said to be owing to accident, and in which the most simple and useful combination arose out of the most complicated circumstances."

"The results of these labours (he continues) will, I trust, be useful, to the cause of science, by proving, that even the most apparently abstract truths may be connected with applications to the common wants and purposes of life."

He concludes his preface, by remarking, that "the gratification of the love of knowledge is delightful to every refined mind; but a much higher motive is offered for indulging in it, when that knowledge is felt to be practical power, and when that power may be applied to lessen the miseries, or increase the comforts of our fellow-creatures."

To this work I must refer the reader for minute details of all that relate to the discovery and construction and use of the safety lamp, and to that destructive element the fire-damp, from which it was to serve as a protection. Relative to these subjects, I shall in this place do little more than introduce such notices as are likely to interest the general reader, and draw his attention for full satisfaction to the original documents.

“ Since the earliest period of the application of mineral coal* to the purposes of fuel, the explosions in coal mines from inflammable air, or fire-damp, have been regarded as the greatest evil occurring in the working of the mines. The strata of coal lie usually parallel, or nearly parallel to the surface, at certain depths beneath it; and this coal, when the pressure of the superincumbent material is removed, affords inflammable air, which is disengaged not only in the common operations of mining, when the coal is broken and removed, but is likewise permanently evolved, often in enormous quantities, from fissures in the strata.

“ When it has accumulated in any part of the gallery or chamber of a mine, so as to be mixed in certain proportions with common air, the presence of a lighted candle, or lamp, causes it to explode, and to destroy, injure, or burn whatever is exposed to its violence.

“ To give detailed accounts of the tremendous accidents owing to this cause, would be merely to multiply pictures of death and of human misery. The phenomena are always of the same kind. The miners are

* Coal was certainly worked in the neighbourhood of Newcastle in 1245. See Brande's History of Newcastle, vol. ii. p. 253.

either immediately destroyed by the explosion, and thrown with the horses and machinery through the shaft into the air, the mine becoming as it were an enormous piece of artillery, from which they are projected; or they are gradually suffocated, and undergo a more painful death from the carbonic acid and azote remaining in the mine after the inflammation of the fire-damp; or what, though it appears the mildest, is perhaps the most severe fate, they are burnt or maimed, and often rendered incapable of labour, and of healthy enjoyment for life.

“The fire-damp is found in the greatest quantity and is most dangerous in the deepest mines, but it likewise often occurs in superficial excavations; and I have now a letter of June 8th, 1816, in my possession, in which it is stated, that in the very commencement of working a coal mine in Shropshire, several miners were killed, and others severely burnt.

“Modes of preventing accidents from fire-damp have been ardently sought for by all persons connected with coal mines, and it has even occupied the attention of an enlightened government. In consequence of some explosions which prevented the miners from working the coal mines at Briançon, in Dauphiny, the Duc de Choiseul, at that time prime minister of France, recommended the subject to the consideration of the Academy of Sciences, and a committee was appointed who made it for some time the object of their attention; but the plan that they proposed for avoiding the danger was a common mode of ventilation.

“This evil of the fire-damp, though belonging to all coal mines, had been most severely experienced in those of Hainault in Flanders, and the infinitely more

important mines in the neighbourhood of Whitehaven and Newcastle in this country. The number of dreadful accidents, indeed, which had happened within the last three or four years in the last-mentioned districts, particularly that by which ninety-six persons were destroyed in the Felling colliery, had so strongly impressed the minds of a number of benevolent persons belonging to, or connected with, the coal districts, that it was said to be in their contemplation to bring the subject before parliament; that by making it a national question it might obtain that consideration which its importance demanded.

“ When I first turned my attention particularly to the subject, which was in August 1815, in consequence of a letter from the Rev. Dr. Gray, there appeared very little hope of finding an efficacious remedy. The resources of modern chemical science had been fully applied in ventilation, in the improved plans of Mr. Buddle; the comparative lightness of the fire-damp was well understood; every precaution was taken to preserve the communications open; and the currents of air were promoted or occasioned not only by furnaces, but likewise by air pumps and steam apparatus.”

He began his successful search after a remedy by instituting a minute investigation of the composition of fire-damp, and of its chemical qualities.

He found, as had been before stated by Dr. Henry, that it was hydrogen or pure inflammable air combined with charcoal or carbon; that compound known to chemists by the name of light carburetted hydrogen.

He found that it required to be mixed with a very large quantity of atmospheric air, to produce an ex-

plosion ; that it was the least readily combustible of all the inflammable gases, or required the highest temperature, being neither exploded nor fired by red-hot charcoal, or red-hot iron ; and further, that the heat it produced when inflamed was less than from any other inflammable gas, and consequently that the expansive effect from heat attending its explosion was also less.

He found that on mixing one part of carbonic acid, or fixed air, with seven parts of an explosive mixture of fire-damp, or one part of azote with six parts, their powers of exploding were destroyed.

He found that in exploding a mixture in a glass tube, of one fourth of an inch in diameter and a foot long, more than a second was required before the flame reached from one end to the other ; and that in tubes of one-seventh of an inch in diameter, explosive mixtures could not be fired, when they were opened in the atmosphere ; and that metallic tubes prevented explosion better than glass tubes.

These were the facts from which the discovery of the safety lamp was made ; and the following was the process of reasoning which led to the discovery.

He remarks, — “ In reasoning upon these various phenomena, it occurred to me, as a *considerable* heat was required for the inflammation of the fire-damp, and as it produced in burning a comparatively *small degree* of heat, that the effect of carbonic acid and azote, and of the surfaces of small tubes in preventing its explosion, depended upon their cooling powers, upon their lowering the temperature of the exploding mixture so much that it was no longer sufficient for its continuous inflammation.”

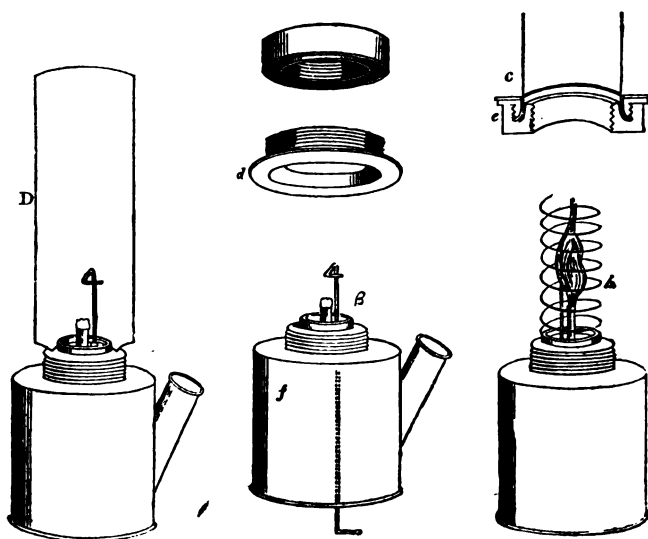
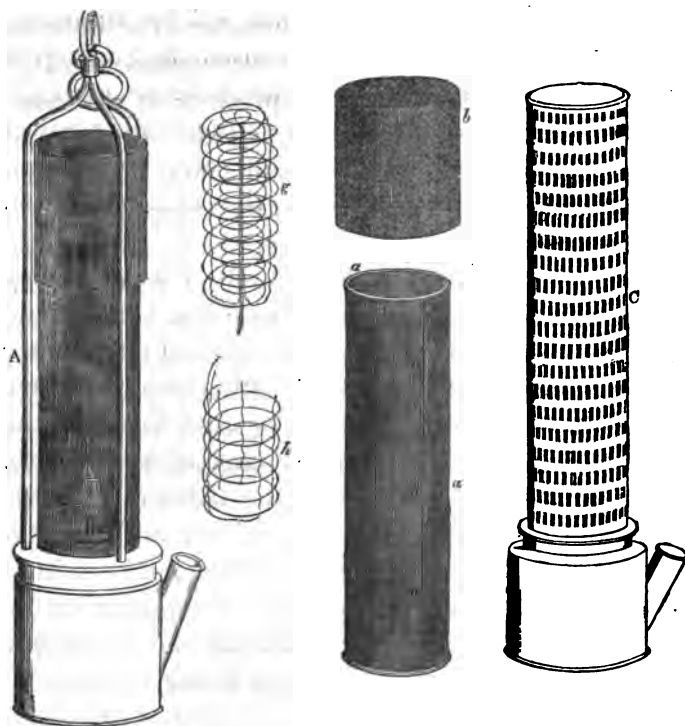
He proceeds, — “ This idea, which was confirmed

by various obvious considerations, led to an immediate result,—the possibility of constructing a lamp in which the cooling powers of the azote or carbonic acid formed by the combustion, or the cooling power of the apertures through which the air entered and made its exit, should prevent the communication of explosion.”

Prosecuting this idea, after various trials, he very soon attained the object of his wishes, and effected more than the most sanguine imagination could have anticipated; more, indeed, than could reasonably have been supposed possible *a priori*. And this was the invention of the safety lamp,—a cage of wire gauze, which actually made prisoner the flame of the fire-damp, and in its prison consumed it; and whilst it confined the dangerous explosive flame, it permitted air to pass and light to escape; and though, from the combustion of the fire-damp, the cage might become red-hot, yet still it acted the part of a safety lamp, and restrained the flaming element within its narrow bounds simply by presenting a surface of net work, the temperature of which the imprisoned flame was not capable of raising to a height required to explode either the fire-damp without, or to allow the flame kindled within to pass unextinguished.

I shall not dwell on the minute construction of the lamp, the manner in which it was improved, and subjected to the most severe explosive tests, or enter further into explanation of its operation, which I hope has been made sufficiently clear to the general reader.

I shall further only briefly mention one of its last improvements, which resulted from a discovery of my brother, made by him in investigating the



nature of flame. This improvement was the addition of a means of giving light in an atmosphere too foul for vivid combustion and the production of flame, by introducing a small cage or spiral of platinum wire just above the wick of the lamp. This had the marvellous effect of occasioning the combination of the inflammable air with oxygen, or its combustion at a temperature only sufficiently high to make the platinum luminous,—not sufficiently high to have this effect on the volatile products of the combustion; or, in other words, produce flame. Thus improved, the miner with the safety lamp might work in any part of the mine where life could be supported, and have the advantage of a steady though feeble light.

“ Explanation of the Plate representing different Forms of the Miner’s Safety Lamp, and of the Apparatus for giving Light in Explosive Mixtures.

“ *a* represents the single cylinder of wire gauze; the foldings *a a a* must be very well doubled, and fastened by wire. If the cylinder be of twilled wire gauze, the wire should be at least of the thickness of one-fortieth of an inch, and of iron or copper, and thirty in the warp, and sixteen or eighteen in the weft. If of plain wire gauze, the wire should not be less than one-sixtieth of an inch in thickness, and from twenty-eight to thirty both warp and woof.

“ *b* represents the second top, which fits upon *a*.

“ *c* represents a cylinder of brass, in which the wire gauze is fastened by a screw to prevent it from being separated from the lamp by any blow. *c* is fitted into a female screw, which receives the male

screw β of the lamp : f is the lamp furnished with its safe trimmer and safe feeder for oil.

“ A is the wire gauze lamp put together with its strong wire supports, which may be three or four receiving the handle.

“ g is a small cage made of wire of platinum, of one-seventieth or one-eightieth of an inch in thickness, fastened to a wire for raising it above the wick, for giving light in inflammable media containing too little air to be explosive.

“ h is a similar cage for placing in the bottom of the lamp, to prevent it from being smoked by the wick.

“ C is a lamp of which the cylinder is copper, of one-fortieth of an inch in thickness, perforated with longitudinal apertures of not more than the one-sixteenth of an inch in length, and the one-thirtieth in breadth. In proportion as the copper is thicker, the apertures may be increased in size. This form of a lamp may be proper where such an instrument is only to be occasionally used ; but for the general purposes of the collier, wire gauze, from its flexibility and the ease with which new cylinders are introduced, is much superior.

“ D is a lamp fitted with a tin plate mirror of half the circumference of the cylinder, and reaching as high as the single top, which may be used in strong currents of fire-damp, to prevent the heat from rising too high.

“ All these forms of the wire gauze lamp are equally safe.* In the twilled gauze lamp, less fire-damp is burnt, and the radiating and cooling surface

* That is, according to circumstances, as explained, and on the principle distinctly pointed out, “ that the cylinder should in no case be suffered to be heated above dull redness.” Inattention to this, has led to innumerable errors and misstatements, and, it is to be feared, to accidents.

is greater, and it is therefore fitted for very explosive mixtures or for explosive currents. The wire gauze lamp with a double cylinder, or with a reflector, answers the same purpose.

“The general principle is, that the cylinder should in no case be suffered to be heated above dull redness; and this is always effected by increasing the cooling surfaces, or by diminishing the circulation of the air.

“Mr. Newman has applied a lens to the exterior of some of the lamps; which, when a strong light is required to be thrown upon particular objects or parts of the mine, has been found useful.”

Some extracts may now be given on the application of the safety lamp, from communications to my brother. They are taken from the third section of his work, prefaced by the remark, that “the evidence of the use of a practical discovery is of most value when furnished by practical men;” and are well adapted to give just ideas of the danger encountered and overcome, and of the simplicity of the means by which it was effected.

Extract from a Letter on the Practical Application of the Wire Gauze Safe Lamp, from John Buddle, Esq. to Sir H. Davy.

“Walls End Colliery, Newcastle, 1st June, 1816.

“After having introduced your safety lamp into general use, in all the collieries under my direction, where inflammable air prevails, and after using them daily in every variety of explosive mixture, for upwards of three months, I feel the highest possible gratification in stating to you that they have answered to my entire satisfaction.

“ The safety of the lamps is so easily proved by taking them into any part of a mine charged with fire-damp, and all the explosive gradations of that dangerous element are so easily and satisfactorily ascertained by their application, as to strike the minds of the most prejudiced with the strongest conviction of their high utility ; and our colliers have adopted them with the greatest eagerness.

“ In the practical application of the lamps, scarcely any difficulty has occurred. Those of the ordinary working size, when prepared with common cotton wick and the Greenland whale oil, burn during the colliers’ *shift* or day’s work of six hours without requiring to be replenished ; and the safety trimmer answers the purpose of cleaning, raising, and lowering the wick completely.

“ The only inconvenience experienced arises from the great quantity of dust, produced in some situations by working the coal, closing up the meshes of the wire gauze, and obscuring the light ; but the workmen very soon removed this inconvenience by the application of a small brush.

“ Our colliers have found it most convenient to hang the stationary lamps from small wooden pedestals ; but, on observing that where the side of the lamps have been suffered to come in contact with the pedestals the wood is charred to a considerable depth by the heat of the lamps, I have thought it right to use small iron pedestals instead of the wooden ones.

“ Besides the facilities afforded by this invention to the working of coal mines abounding in fire-damp, it has enabled the directors and superintendants to ascertain, with the utmost precision and expedition, both the presence, the quantity, and the correct situation of the gas. Instead of creeping inch by inch

with a candle, as is usual, along the galleries of a mine suspected to contain fire-damp, in order to ascertain its presence, we walk firmly on with the safe lamps, and with the utmost confidence prove the actual state of the mine. By observing attentively the several appearances upon the flame of the lamp, in an examination of this kind, the cause of accidents which have happened to the most experienced and cautious miners is completely developed ; and this has been, in a great measure, matter of mere conjecture.

“ When the discharge of inflammable air is regular, and the density of the atmosphere continues uniform, the firing point may be judged of and approached with safety by a common candle ; but when the discharge of inflammable air is irregular, or the atmosphere is in an unsettled state, a degree of uncertainty and danger attends the experiment of ascertaining the state of a mine. With the safe lamp, however, it is reduced to the utmost certainty ; the actual presence and position of the gas is not only ascertained with the greatest precision, but also every alteration of circumstance or position is distinctly perceived.

“ By placing a lamp near the spot where a quantity of inflammable air is issuing and mixing with the circulating current of atmospherical air to the firing point, it will be seen that very remote causes frequently produce pulsations in the atmosphere of the mine, which occasion the gas to fire at naked lights ; thus showing clearly the instability of the element with which we have to deal, and the reason why so many explosions have occurred where lights have not approached the place where the gas was lodged within a considerable distance.

“ Objections have been made by some who have not had experience of the lamps to the delicacy of the wire gauze, under the apprehension that it may be very soon impaired by the flame within the cylinder. Of this, however, I have no reason to complain, as after three months’ constant use, the gauze has not, in the hands of careful workmen, been perceptibly injured by the action of the flame : but the outer top gauze of one or two of Newman’s making has been worn through by the friction of the rivet on the bottom of the swivel, to which the finger ring is fastened. But this only happened to the lamps used by the *wastemen*, whose business it is to travel daily in the various avenues of the mines, for the purpose of keeping the passage for the current of air free from obstructions ; nothing of the kind has happened to the stationary lamps used by the colliers. In short, I do not apprehend that the gauze can be injured by any ordinary cause without being observed in time sufficient to prevent accidents ; and that we have no danger to apprehend except from the gross negligence of some heedless individual, or an accident of a very unusual description occurring to injure the gauze.

“ I find that I have extended my letter to a greater length than I had intended ; but, I trust, Sir, that you will excuse me for having gone so much into detail, — as I feel peculiar satisfaction in dwelling upon a subject which is of the utmost importance, not only to the great cause of humanity, and to the mining interest of the country, but also to the commercial and manufacturing interests of the United Kingdom ; for I am convinced that by the happy invention of the safe lamp large proportions of the coal mines of the empire will be rendered available,

which otherwise might have remained inaccessible, at least without an invention of similar utility, which could not have been wrought without much loss of the mineral, and risk of life and capital.

“ It is not necessary that I should enlarge upon the national advantages which must necessarily result from an invention calculated to prolong our supply of mineral coal, because I think them obvious to every reflecting mind ; but I cannot conclude, without expressing my highest sentiments of admiration for those talents which have developed the properties, and controlled the power, of one of the most dangerous elements which human enterprise has hitherto had to encounter.”

*Extracts from Papers written by John Buddle, Esq.
on the Use of the Wire Gauze Safety Lamp.*

“ Having observed in some of the periodical publications certain remarks on Sir Humphry Davy’s lamp, which, in my mind, appear to have originated in motives unconnected with truth and the improvement of science, I feel myself called upon to do an act of justice to the merit of the invention in a public statement of its great utility and extensive use in the coal mines of this country.

“ During the last ten months it has been extensively employed in all the collieries under my inspection ; and it gives me the highest pleasure to be able to state that during that time not the slightest accident by fire has occurred from its use, though several hundreds of lamps are daily employed.

“ In the parts of mines where fire-damp prevails, the surveys and inspections are now carried on by the

old • Dated May, 1818.

light of the lamp, without apprehension of danger from explosion, for experience has shown us that with the caution of keeping it in proper repair it is absolutely safe; and for the truth of this, I appeal to all my professional brethren who have had occasion to use it without fear of contradiction.

“The colliers never hesitate a moment to take it into any respirable part of a mine, however much it may be charged with fire-damp; for whenever it appears that the air, either from discharges of gas or from casual interruptions of the circulating current becomes explosive, only give the collier his *Davy* (the name applied in our mines to the safe lamp), and he goes to his occupation with the same confidence in this impure atmosphere that he would do in any other situation with a candle.

“There has been much quibbling about the *perfect safety* of the wire gauze lamp. I scarcely know how the words *perfect safety* can apply to any invention for the preservation of human life; but when we have seen some hundreds of the wire gauze lamps in daily use for several months past, in all varieties of explosive mixture in the most dangerous mines of this country, without the slightest accident occurring, it seems only reasonable to infer, that they approximate as nearly to perfect safety as anything of human contrivance or manufacture can be expected to do.

“It would, however, be quite unreasonable to expect that accidents are never to happen where the wire gauze lamps are used; for it must always be remembered that, setting aside the chance of their being damaged by some of the casualties incidental to coal mining, they are to be entrusted to the

management of a body of men, amongst whom negligent individuals will be found, who may use damaged lamps, or expose the naked flame to the fire-damp, in spite of the utmost vigilance of the overmen and inspectors of mines.

“ Instances of great negligence have occurred, fortunately without any ill consequences, always with the dismissal of the offender from his employment; but it would be absurd to condemn the lamp, or even to quibble upon its want of safety, on this account.

“ In the most extensive coal mines in the north of England, where the fire-damp prevails to such an extent as to require the general use of the safety lamp, it has been found most advantageous to employ a steady person to take charge of the lamps, and who is made responsible for keeping them in good order; a chamber is allotted to him, in which he keeps a number of spare lamps, together with oil and cotton for replenishing the lamps which are in use.

“ The brass collars of the wire gauze cylinders are secured to the bottoms of the lamps by locks, which can only be opened by the lamp-keeper; so that the workmen cannot either by accident or carelessness expose themselves to danger by separating the wire gauze cylinders from the bottoms of the lamps.

“ After finishing their day's work, the colliers bring their *Davys* to the lamp-keeper's *cabin*, who, unlocking them, takes the bottoms into his own possession, and allows the colliers to take the wire gauze cylinders home, for the purpose of cleaning them thoroughly. When the colliers return to their work the following morning, the lamp-keeper, having replenished the lamps with oil and cotton, lights

them, and screws on their tops, and then examines them with the utmost care before he delivers them for use ; but if the least injury or defect appears in the gauze, or any other part of the lamp, it is immediately set aside to be repaired, and the person to whom it belongs is supplied with a perfect one. After having despatched the business of the morning, the lamp-keeper occupies himself during the day in walking leisurely through amongst the workmen, carrying some spare lamps with him, to replace such as may happen to be extinguished, &c.: after a little practice, the lamp-keepers acquire great dexterity in the trimming &c. their lamps, and quickly discover the least defect or injury in the wire gauze.

“ It is scarcely necessary to observe that the lamp-keeper’s cabin is always placed in a secure part of the mine, as near the workings as circumstances will permit.

“ J. B.”

Extract of a Letter from Mr. Peile to Sir H. Davy.

“ Colliery Office, Whitehaven, 6th July, 1816.

“ I take the liberty of adding a further statement on your invaluable safe lamps in the Whitehaven collieries, belonging to the Earl of Lonsdale, since the first application of them in February last. With us the general use of the lamps, in consequence of the good state of our ventilation, is confined to leading workings or trial drifts ; and in two of these, lately going on in one of the pits unusually infected with fire-damp, and which previously were lighted by means of steel mills, we applied the lamps with great

confidence and security. In May last in these drifts an extraordinary discharge of fire-damp burst from the pavement of the mine; and the ventilation being at that time unavoidably obstructed, the atmosphere became so charged with fire-damp as to be nearly throughout an explosive mixture. In this situation we derived the unspeakable benefit of light from the lamps, and, notwithstanding the explosive state of the mixture, with the most perfect safety.

“ In several other places in the collieries the lamps are used with the same confidence; yet the discharge of fire-damp being very moderate, they are not much exposed to explosive mixtures.

“ In all the workings showing the least appearance of fire-damp, the miners are supplied with lamps, and are particularly cautioned to use them on first entering, when beginning to work, where being satisfied of security they occasionally resort to candles afterwards. This application of the lamp alone is of the greatest utility, and prevents many slight explosions, and the miners from being burned, besides superseding the necessity of depending on the judgment or discrimination of any individual, to prove the existence of the fire-damp in the old method by the candle flame.

“ From the repeated proofs made with the lamps we cannot too strongly express our confidence in their security. By experiment a pint of oil, value sixpence, will about supply a lamp for six days, the ordinary time of a man's working; so that they are cheaper than candles.

“ If my humble testimony can in any degree promote the speedy use of the lamp in other places, it will give me great pleasure.

“ J. PEILE.”

Extract of a Letter from Mr. John Morris, Plas Issa, 27th January, 1817, to John Simmons, Esq., Paddington House.

“ SIR,

“ You will be pleased to recollect, that some time in the month of June last I applied to you, with a request that you would send me immediately some of Sir Humphry Davy’s safety lamps, in consequence of an explosion of the fire-damp taking place in one of your coal mines, by which several of the workmen were dreadfully burnt and bruised. On the arrival of the safety lamps, no accurate account of their use accompanied them; but I at length obtained, I think, the “Edinburgh Review,” in which was a detail of some experiments. This I read to the colliers, which gave them some confidence in the lamps, prior to which they treated them with silent contempt; and I found, notwithstanding these interesting details, that a great doubt existed in their minds. I, therefore, was obliged to give the most peremptory orders to prepare to descend, and assisting in every preparation and execution myself. But the men’s wives had collected, and made so much noise and lamentation that it was with some difficulty I could keep them off. Having got over this obstacle, and the men down in the pit, instantaneous destruction was momentarily anticipated when the least noise was heard. I, however, had not the least alarm, or the smallest doubt of success, and consequently did all I could to remove their dreadful anxiety. The men had no sooner descended than the enemy was discovered, which, they say, much alarmed them, and they would have retreated if they could; but finding that

impossible, took courage, and soon found they had destroyed the enemy so far : advancing a little further, they found him again, and again destroyed him, and so on through the whole work. Thus the first alarm was got over, when all the knowing men of the neighbourhood were got collected together to hear the result, all of whom were astonished and amazed that so simple a looking instrument should destroy and defy an enemy heretofore unconquerable. The same precaution and use of the lamp was gone through the second day; and when the damp was destroyed, we began working, and continued to work in this way for some weeks.

“GEORGE MORRIS.”

After giving these extracts, my brother adds—

“I am possessed of a great number of similar documents respecting the use and application of the lamp; but they are in general so flattering that I might well be suspected of vanity if they were to be laid before the public.”

The account of the safety lamp alluded to by Mr. Morris is in the “Edinburgh Review,” soon after its discovery, in the number for February, 1816, written by a philosopher who deserved the name, in the best sense of the word, the late Mr. Playfair,—a man who was distinguished by his private worth, no less than by variety of attainments in literature and profound knowledge in the exact sciences, tempered by a modesty, mildness, and benignity most suitable to the philosophical character. I cannot refrain from indulging myself in quoting his remarks relative to this discovery; they are the confirming testimonies of science, as the former extracts were of practical art;

they are, moreover, characteristic of the writer, of the generous and noble sentiments which were habitual to him, and are a fine specimen of his philosophical style of thinking and writing.

He begins with observing, that "Bacon could say with truth, at the time when he wrote, that science could hardly boast of a single experiment which had served to increase the power, to diminish the suffering, or to augment the happiness of mankind. '*Jam per tot annorum spatia, vix unum experimentum adduci potest quod ad hominum statum levandum et juvandum spectat, et philosophiæ speculationibus ac dogmatibus, neve acceptum referri possit.*' Were the great reformer of philosophy now to return to the earth, he would have the satisfaction to see how vast a change had been produced by that method of philosophising from which he had anticipated such wonderful results. In the powerful assistance which the navigator has derived from the united efforts of the mathematician and astronomer, and in the helps which so many of the arts are continually receiving from mechanics and chemistry, he would perceive the strongest illustration of the maxims of his own philosophy, and the clearest proof that he who first recommended experiment and induction has a right to stand in the first rank of the benefactors of the human race. In contemplating the many fruits that had sprung from the reformed philosophy, we are not sure that he would have derived more satisfaction from any single object than from that which has been just announced (the safety lamp). We certainly know of none on which the admirer of science and the lover of mankind have greater reason to congratulate one another."

After having given an account of the safety lamp, and of the train of investigation which terminated in its discovery, and of its powers and manner of acting, Mr. Playfair thus proceeds :—“ If we might presume to add anything on the subject, it would be with respect to what may be called the scientific merit of the discovery, and of the experiments which led to it. The safe lamp is a present from philosophy to the arts, and to the class of men furthest removed from the influence of science. The discovery is in no degree the effect of accident ; and chance, which comes in for so large a share in the credit of human inventions, has no claims on one which is altogether the result of patient and enlightened research.

“ The author of this invention has been too long trained in the school of experimental investigation, not to be well aware that the riches of nature and the resources of art are not to be found, but in the diligent and scrupulous examination of the phenomena.

“ He began, therefore, with inquiring into the peculiar nature of the gaseous substances, by the inflammation of which such terrible effects had been produced. When he perceived the high temperature required for their inflammation, it immediately occurred that on this circumstance some defence against its violence might, perhaps, be founded, and some limits set to the rapidity of its communication. By following this suggestion through a train of laborious, difficult, and often dangerous experiments, the obstacle which this principle set to the communication of flame from one portion of the fire-damp to the other, the effect of narrow tubes, of perforated plates, and finally of wire gauze, came all successively in

view. Through the whole we find a series of experiments judiciously directed to their object, and steadily pursued, till, without the intervention of any thing casual, they led to the simple and effectual contrivance which has just been described."—And he adds, —

“ This is exactly such a case as we should choose to place before Bacon, were he to revisit the earth, in order to give him, in a small compass, an idea of the advancement which philosophy has made, since the time when he had pointed out to her the route which she ought to pursue. The great use of an immediate and constant appeal to experiment cannot be better evinced than in this example. The result is as wonderful as it is important. An invisible and impalpable barrier made effectual against a force the most violent and irresistible in its operations; and a power, that in its tremendous effects seemed to emulate the lightning and the earthquake, confined within a narrow space, and shut up in a net of the most slender texture,— are facts which must excite a degree of wonder and astonishment, from which neither ignorance nor wisdom can defend the beholder. When to this we add the beneficial consequences and the saving of the lives of men, and consider that the effects are to remain as long as coal continues to be dug from the bowels of the earth, it may fairly be said that there is hardly in the whole compass of art or science a single invention of which one would rather wish to be the author. It is little that the highest praise, and that even the voice of national gratitude, when most strongly expressed, can add to the happiness of one who is conscious of having done such a service to his fellow men. We hope, however,

that some distinguished mark of such gratitude will not be wanting to a person who, by disarming one of the most powerful agents of destruction, has so well merited a civic crown. In this, indeed, the honour of the giver is more interested than the receiver. The latter may not admit of much increase; but it nevertheless becomes those who administer the affairs of a free people, to show themselves grateful for benefits conferred, even on the humblest and most obscure of their fellow citizens."

The ardour with which my brother pursued science was strongly shown in the rapidity of his labours relating to this great discovery. In August, 1815, he states, as has been already mentioned, that his attention was first particularly directed to the subject of fire-damp. He was then in the Highlands of Scotland on a shooting excursion. On his way back he stopped at Newcastle, and made minute inquiries into the circumstances of the mines in connection with the destructive agent. At his request, specimens of fire-damp were forwarded to him in London. He then entered, in the laboratory, on the experimental investigation. On the 9th of November the results of his inquiry were read to the Royal Society, and the principle of the safe lamp was announced; and the lamp itself was perfected in December.

Such a successful result and triumph of experimental science over difficulties so formidable, and apparently unconquerable, would have more than satisfied ordinary minds; his mind was rather stimulated by it to fresh exertion: and, without stop, he engaged in a new series of labours relating to the nature of flame, which he prosecuted with the same

zeal, and made discoveries, not indeed so important to society as the former, but almost as curious, unexpected, and extraordinary, and hardly less important in relation to science. Of these labours I shall now give some account, extracted from the second section of his work, last referred to, and in the order observed by him.

In January, 1816, a paper of his was read to the Royal Society, and published in its Transactions for the same year, entitled "Further Experiments on the Combustion of Explosive Mixtures, confined by Wire Gauze, with some Observations on Flame;" in which, after investigating the properties of wire gauze in relation to flame, he applied this texture to investigate the nature of flame itself. He proves that flame, "in all cases, must be considered as a combustion of *an explosive mixture* of inflammable gas, or vapour and air;" that "the heat communicated by flame must depend upon its mass; and that the real temperature of visible flame is, perhaps, as high as any we are acquainted with." This last proposition he illustrated by mention of an experiment of Mr. Tennant, who used to fuse a very delicate filament of platinum in the flame of a common candle, a metal which is infusible in the strongest smelting furnace; and by the fact, that a stream of air may be heated so high as to make a metallic body exposed to it white-hot, and yet not be itself luminous.

His next paper is dated July, 1816, and was published in the Journal of Science and the Arts for that quarter, under the name of "Some new Views and Experiments respecting Flame."

It is my wish, in composing this work, to excite a taste in young persons for physical research; and the

study of nature in the only way in which it is delightful—not in sedentary reading, and the loading of the memory with information, before a power of digesting or assimilating such information is acquired; but in active exertion and scrutiny, in which the senses are sharpened by the intellect, and the mind is furnished with materials for contemplation by the senses, and there is a constant advance made in true and useful knowledge.

The paper, the title of which has just been given, is well adapted to aid in promoting such a taste. A difference merely of the appearance of flame of coal gas, burning in a jet in the open air, and in the wire gauze safe lamp, mixed with common air, forming an explosive mixture (in the former bright and strong, in the latter pale and feeble), is the immediate object of inquiry. This problem, investigated experimentally, leads to a number of new and unexpected results; and these results to various new and speculative views, showing in a remarkable manner the richness of nature, the importance of minute attention to phenomena, and the extraordinary way in which they are linked together.

It was first conjectured that the feebleness of the flame of the explosive mixture burning in the wire gauze lamp might be owing to imperfect combustion; but this was disproved by experiment.

“ In reflecting on the circumstances of the two species of combustion (my brother remarks), I was led to imagine that the cause of the superiority of the light of the *stream* of coal gas might be owing to the *decomposition* of a part of the gas towards the interior of the flame, where the air was in smallest quantity, and the deposition of solid charcoal, which, first by

its *ignition*, and afterwards by its combustion, increased in a high degree the intensity of the light ; and a few experiments soon convinced me that this was the true solution of the problem.

“ I held a piece of wire gauze, of about 900 apertures to the square inch, over a stream of coal gas issuing from a small pipe, and inflamed the gas above the wire gauze, which was almost in contact with the orifice of the pipe, when it burned with its usual bright light. On raising the wire gauze, so as to cause the gas to be mixed with more air before it inflamed, the light became feebler ; and at a certain distance the flame assumed the precise character of that of an explosive mixture, burning within the lamp ; but though the light was so feeble in this last case, the heat was greater than when the light was much more vivid, and a piece of platinum held in this feeble blue flame became instantly white-hot.

“ On reversing the experiment by inflaming a stream of coal gas, and passing a piece of wire gauze gradually from the summit of the flame to the orifice of the pipe, the result was still more instructive ; for it was found that the apex of the flame, intercepted by the wire gauze, afforded no solid charcoal ; but in passing it downwards, solid charcoal was given off in considerable quantities, and prevented from burning by the cooling agency of the wire gauze ; and at the bottom of the flame, where the gas burnt blue in its immediate contact with the atmosphere, charcoal ceased to be deposited in visible quantities.

“ This principle of the increase of the brilliancy and density of flame, by the production and ignition of solid matter, appears to admit of many applications.

“ First, It explains readily the appearances of the different parts of the flames of burning bodies, and of flame urged by the blow-pipe ; the point of the inner blue flame, where the heat is greatest, is the point where the whole of the charcoal is burnt in its gaseous combinations without previous deposition.

“ Secondly, It explains the intensity of the light of those *flames* in which *fixed* solid matter is produced in combustion ; such as that of the flame of phosphorus, and of zinc in oxygen, &c., and of potassium in chlorine : and the feebleness of the light of those flames in which gaseous and volatile matter alone is produced ; such as those of hydrogen, and sulphur in oxygen, phosphorus in chlorine, &c.

“ Thirdly, It offers means of increasing the light of burning substances. Thus, the intensity of the light of burning sulphur, carbonic oxide, &c. is wonderfully increased by throwing into them oxide of zinc, or by placing in them very fine amianthus or metallic gauze. .

“ Fourthly, It leads to deductions respecting the chemical nature of bodies, and various phenomena of their decomposition. Thus ether burns with a flame which seems to indicate the presence of olefiant gas in that substance. Alcohol burns with a flame similar to that of a mixture of carbonic oxide and hydrogen ; so that the first is, probably, a binary compound of olefiant gas and water, and the second of carbonic oxide and hydrogen.

“ When cuprane, or protochloride of copper, is introduced into the flame of a candle or lamp, it affords a peculiar, dense, and brilliant red light, tinged with green and blue towards the edges, which seems to depend upon the chlorine being separated from the

copper by the hydrogen, and the ignition and combustion of the solid copper and charcoal.

“ Similar explanations may be given of the phenomena presented by the action of other combinations of chlorine on flame ; and it is probable in many of those cases, when the colour of flame is changed by the introduction of incombustible compounds, that the effect depends upon the production and subsequent ignition or combustion of inflammable matter from them. Thus, the rose-coloured light given to flame by the compounds of strontium and calcium, and the yellow colour given by those of barium, and the green by those of boron, may depend upon a temporary production of these bases by the inflammable matter of the flame.

“ Whenever a flame is remarkably brilliant and dense, it may be always concluded that some solid matter is produced in it ; on the contrary, when a flame is extremely feeble and transparent, it may be inferred that no solid matter is formed. Thus, none of the volatile combinations of sulphur burn with a flame in the slightest degree opaque, and consequently there is no reason from the phenomena of its flame to suspect the existence of any fixed basis in sulphur.

“ Fifthly, These views will probably offer illustrations of electrical light. The voltaic arc of flame from the great battery differs in colour and intensity according as the substances employed in the circuit are different, and is infinitely more brilliant and dense with charcoal than with any other substance. May not this depend upon particles of the substances separated by the electrical attractions ?

“ Sixthly, The heat of flames may be actually diminished by increasing their light (at least the heat com-

municable to other matter), and *vice versa*. The flame from combustion, which produces the most intense heat among those I have examined, is that of a mixture of oxygen and hydrogen in slight excess, compressed in a blow-pipe apparatus, and inflamed from a tube having a very small aperture. This flame is hardly visible in bright daylight, yet it instantly fuses very refractory bodies; and the light from solid matters ignited in it is so vivid as to be painful to the eye."

"*Some additional researches on flame*" were communicated by him to the Royal Society in January, 1817, and published in the "Philosophical Transactions" for the same year. The whole of the dissertation is an instructive one, and well deserving of being studied, as an example of patient, minute, and correct scientific investigation, and for the curious knowledge which it imparts, though none of the results are of a brilliant character.

He first proves, in opposition to the statement of M. de Grotthus, that the rarefaction of inflammable gases by itself does not diminish their combustibility; and that the rarefaction produced by removal of pressure diminishes combustibility only by its cooling influence; and that accordingly the less high the temperature required by a gas for its inflammation, so much the more it may be rarefied without being deprived of its power of inflaming. Agreeably to this, from his experiments it appears that light carburetted hydrogen, or pure fire-damp, is most readily prevented by expansion from kindling, and phosphuretted hydrogen least so; the one burning was extinguished when the atmospheric pressure was diminished less than a fourth, whilst the other flashed when admitted

in the most complete vacuum which could be formed by an air pump of excellent construction.

He next proves, also in opposition to the assertion of M. de Grotthus, "that expansion by heat, instead of diminishing the combustibility of gases, on the contrary, enables them to explode at a lower temperature;" and, in opposition to the opinion of Dr. Higgins and M. Berthollet, that it is not compression (when compression is used or occurs) which occasions the combinations of gases, but the heat evolved by the compression.

Thirdly, he shows that the power of gases to prevent explosion, when added to an explosive mixture, is not according to their densities or their capacities for heat, but is in relation to their cooling power on the mixture; and that this is different from the power which they possess of abstracting heat from solid surfaces; and whatever be its cause, it is exercised similarly on all kinds of explosive mixtures: those mixtures which require least heat for their combustion require a proportionally large quantity of the different gases to prevent combustion. "There is (he adds) a very simple experiment, which demonstrates in an elegant manner this general principle. Into a long bottle with a narrow neck, introduce a lighted taper; it will be extinguished before it reaches the bottom of the neck: then introduce a small tube containing zinc and diluted sulphuric acid, and at the aperture of which the hydrogen is inflamed; the hydrogen will be found to burn in whatever part of the bottle the tube is placed: after the hydrogen is extinguished, introduce lighted sulphur; this will burn for some time, and after its extinction phosphorus will be as luminous as in the air; and if heated in the

bottle will produce a pale yellow flame of considerable density." And immediately after he announces the important fact, that though the addition of a gas to an inflammable mixture may prevent its inflammation, yet it may not prevent combination; the gases may combine slowly without the production of light. He adds some conjectures respecting the temperature of flames, which he supposes to be very different in different instances of chemical combination; and he adduces facts which he had ascertained by experiment in support of this idea: thus he found "that a filament of platinum was fused by a flame of cyanogen in the air, which was not fused by a similar flame of hydrogen;" indicating that gaseous carbon affords a more intense heat than hydrogen in combustion.

He concludes this paper with some general remarks and practical applications, chiefly in reference to the safety lamp, the principle of which, as already given, he confirms and illustrates by facts of the greatest simplicity and most conclusive kind.

These researches on flame were speedily followed by others developing a very curious effect, namely, ignition without inflammation; indeed, by the same method that he imprisoned flame in the safety lamp of wire gauze, he proceeded further, and removed the flame entirely. The paper giving an account of this singular discovery is dated January, 1817, and was published in the same volume of the "Philosophical Transactions" as the last. I shall reprint the whole of it, believing that it cannot fail to interest, and considering it as well adapted as the former (that of July, 1816), which has been given almost entire, to serve as a model of research, and to kindle a love of original inquiry.

“ Some new Experiments and Observations on the Combustion of Gaseous Mixtures, &c.

“ In the last paper I have described the phenomena of the slow combustion of hydrogen and olefiant gas without flame. In the same paper I have shown that the temperature of flame is infinitely higher than that necessary for the ignition of solid bodies. It appeared to me, therefore, probable, that in certain combinations of gaseous bodies,—for instance, those above referred to,—when the increase of temperature was not sufficient to render the gaseous matters themselves luminous, yet still it might be adequate to ignite solid matters exposed to them. I had devised several experiments on this subject. I had intended to expose fine wires to oxygen and olefiant gas, and to oxygen and hydrogen, during their slow combination under different circumstances, when I was accidentally led to the knowledge of the fact, and at the same time to the discovery of a new and curious phenomenon.

“ I was making experiments on the increase of the limits of the combustibility of gaseous mixtures of coal gas and air by increase of temperature. For this purpose I introduced a small wire gauze safe lamp with some fine wire of platinum fixed above the flame, into a combustible mixture containing the maximum of coal gas; and when the inflammation had taken place in the wire gauze cylinder I threw in more coal gas, expecting that the heat acquired by the mixed gas in passing through the wire gauze would prevent the excess from extinguishing the flame. The flame continued for two or three seconds after the coal gas was introduced; and when it was extin-

guished, that part of the wire of platinum which had been hottest remained ignited, and continued so for many minutes; and when it was removed into a dark room, it was evident that there was no flame in the cylinder.

“ It was immediately obvious that this was the result which I had hoped to attain by other methods, and that the oxygen and coal gas in contact with the hot wire combined without flame, and yet produced heat enough to preserve the wire ignited, and to keep up their own combustion. I proved the truth of this conclusion by making a similar mixture, heating a fine wire of platinum, and introducing it into the mixture. It immediately became ignited nearly to whiteness, as if it had been itself in actual combustion, and continued glowing for a long while; and when it was extinguished, the inflammability of the mixture was found entirely destroyed.

“ A temperature much below ignition only was necessary for producing this curious phenomenon; and the wire was repeatedly taken out and cooled in the atmosphere, till it ceased to be visibly red, and yet when admitted again it instantly became red-hot.

“ The same phenomena were produced with mixtures of olefiant gas and air, carbonic oxide, prussic gas, and hydrogen, and in the last case with a rapid production of water; and the degree of heat, I found, could be regulated by the thickness of the wire. The wire, when of the same thickness, became more ignited in hydrogen than in mixtures of olefiant gas, and more in mixtures of olefiant gas than in those of gaseous oxide of carbon.

“ When the wire was very fine, about the one-eightieth of an inch in diameter, its heat increased in

very combustible mixtures, so as to explode them. The same wire, in less combustible mixtures, only continued bright red or dull red, according to the nature of the mixture.

" In mixtures not explosive by flame within certain limits, these curious phenomena took place, whether the air or the inflammable gas was in excess.

" The same circumstance occurred with certain inflammable vapours. I have tried those of ether, alcohol, oil of turpentine, and naphtha. There cannot be a better mode of illustrating the fact than by an experiment on the vapour of ether or of alcohol, which any person may make in a minute. Let a drop of ether be thrown into a cold glass, or a drop of alcohol into a warm one. Let a few coils of wire of platinum, of the one-sixtieth or one-seventieth part of an inch, be heated at a hot poker or a candle, and let it be brought into the glass; it will in some part of the glass become glowing, almost white-hot, and will continue so as long as a sufficient quantity of vapour and of air remain in the glass.

" When the experiment on the slow combustion of ether is made in the dark, a pale phosphorescent light is perceived above the wire, which of course is most distinct when the wire comes to be ignited. This appearance is connected with the formation of a peculiar acrid volatile substance, possessed of acid properties.

" The chemical changes in general produced by slow combustion appear worthy of investigation. A wire of platinum introduced under the usual circumstances into a mixture of prussic gas (cyanogen) and oxygen in excess, became ignited to whiteness, and the yellow vapours of nitrous acid were observed in

the mixture. And in a mixture of olefiant gas, non-explosive from the excess of inflammable gas, much carbonic oxide was formed.

“ I have tried to produce these phenomena with various metals, but I have succeeded only with platinum and palladium; with copper, silver, iron, gold, and zinc, the effect is not produced. Platinum and palladium have low conducting powers, and small capacities for heat, compared with other metals, and these seem to be the principal causes of their producing, continuing, and rendering sensible these slow combustions.

“ I have tried some earthy substances, which are bad conductors of heat; but their capacities and powers of radiating heat appear to interfere. A thin film of carbonaceous matter entirely destroys the igniting power of platinum, and a slight coating of sulphuret deprives palladium of this property, which must principally depend upon their increasing the power of the metals to radiate heat.

“ Thin laminæ of metals, if their form admits of a free circulation of air, answer as well as fine wires; and a large surface of platinum may be made red-hot in the vapour of ether, or in a combustible mixture of coal gas and air.

“ I need not dwell upon the connection of these facts respecting slow combustion with the other facts I have described in the history of flame. Many theoretical views will arise from this connection, and hints for new researches, which I hope to be able to pursue. I shall now conclude by a practical application. By hanging some coils of fine wire of platinum, or a fine sheet of platinum or palladium, above

the wick of the lamp, in the wire-gauze cylinder, the coal miner, there is every reason to believe, will be supplied with light in mixtures of fire-damp no longer explosive; and should his flame be extinguished by the quantity of fire-damp, the glow of the metal will continue to guide him; and by placing the lamps in different parts of the gallery, the relative brightness of the wire will show the state of the atmosphere in these parts. Nor can there be any danger with respect to respiration whenever the wire continues ignited; for even this phenomenon ceases when the foul air forms about two-fifths of the volume of the atmosphere.

“ I introduced into a wire-gauze safe lamp a small cage made of fine wire of platinum, of the one-seventieth of an inch in thickness; and fixed it by means of a thick wire of platinum, about two inches above the wick, which was lighted. I placed the whole apparatus in a large receiver, in which, by means of a gas holder, the air could be contaminated to any extent with coal gas. As soon as there was a slight admixture of coal gas, the platinum became ignited; the ignition continued to increase till the flame of the wick was extinguished, and till the whole cylinder became filled with flame; it then diminished, when the quantity of coal gas was increased, so as to extinguish the flame. At the moment of the extinction the cage of platinum became white-hot, and presented a most brilliant light. By increasing the quantity of the coal gas still further, the ignition of the platinum became less vivid: when its light was barely sensible, small quantities of air were admitted; its heat speedily increased; and by regulating the admission of coal gas and air, it again became white-

hot, and soon after lighted the flame in the cylinder, which, as usual, by the addition of more atmospherical air, rekindled the flame of the wick.

“ This experiment has been very often repeated, and always with the same results. When the wire for the support of the cage, whether of platinum, silver, or copper, was very thick, it retained sufficient heat to enable the fine platinum wire to rekindle in a proper mixture half a minute after its light had been entirely destroyed by an atmosphere of pure coal gas; and by increasing its thickness, the period might be made still longer.

“ The phenomenon of the ignition of the platinum takes place feebly in a mixture consisting of two of air and one of coal gas, and brilliantly in a mixture consisting of three of air and one of coal gas: the greater the quantity of heat produced, the greater may be the quantity of the coal gas; so that a large tissue of wire will burn in a more inflammable mixture than one made red-hot. If a mixture of three parts of air and one of fire-damp be introduced into a bottle, and inflamed at its point of contact with the atmosphere, it will not explode, but will burn like a pure inflammable substance. If a fine wire of platinum, coiled at its end, be slowly passed through the flame, it will continue ignited in the body of the mixture; and the same gaseous matter will be found to be inflammable, and to support combustion.

“ There is every reason to hope that the same phenomena will occur with the cage of platinum in the fire-damp as those which have been described in its operation on mixtures of coal gas. In trying experiments in fire-damp, *the greatest care must be taken*

that no filament, or wire of platinum, protrudes on the exterior of the lamp, for this would fire externally an explosive mixture. However small the mass of platinum which kindles an explosive mixture in the safe lamp, the result is the same as when large masses are used: the force of the explosion is directed to, and the flame arrested by, the whole of the perforated tissue.

“ When a large cage of wire of platinum is introduced into a very small safe lamp, even explosive mixtures of fire-damp are burnt without flame; and by placing any cage of platinum in the bottom of the lamp round the wick, the wire is prevented from being smoked.”

The discovery announced in this paper was soon followed by that of M. Doebereiner of the property possessed by platinum, in a very finely divided state, of becoming ignited at ordinary temperatures in a mixture of oxygen and hydrogen; and so strongly ignited, owing to the rapidity of combination which it effected, as to inflame the mixture. And this fact, further investigated, soon led to a large number of other curious results relative to the influence of metals in producing chemical combinations, hardly less extraordinary and interesting than the power exhibited in the voltaic pile of the same bodies in different forms and arrangements, of separating the elements of compounds or occasioning decomposition.

To return to the safety lamp.—After pointing out, in the fourth and last section of his work, various precautions in different circumstances to ensure the perfect security of the lamp, deduced from his researches on flame, and for improving its light, and after having described various applications of it as

indicated in the title page, he concludes with observing : —

“ Whatever may be the fate of the speculative part of this inquiry, I have no anxiety as to the practical results, or as to the unimpassioned and permanent judgment of the public on the manner in which they have been developed and communicated; and no fear that an invention for the preservation of human life, and the diminution of human misery, will be neglected or forgotten by posterity. When the duties of men coincide with their interests, they are usually performed with alacrity : the progress of civilisation ensures the existence of all real improvements; and however high the gratification of possessing the good opinion of society, there is a still more exalted pleasure in the consciousness of having laboured to be useful.”

These remarks were dictated by strong feeling, arising from a perfect knowledge of what he had effected, and from a perfect confidence of the efficiency of his invention. In no part of his work, which he designed as a permanent record of his labours in the cause, does he make any allusion to various attempts unworthily engaged in to detract from the merit and originality of his invention. That they annoyed him at the moment, was certain; he must have been more than human had he been indifferent to them; but, fortunately, they had no lasting influence on his mind. He thus expresses himself, in relation to them, in some lines which were hastily written in a notebook : —

“ Though good
Has been repaid with evil, and a gift
Of science and humanity received
With stern ingratitude; yet have I not

Repented, or relax'd in labours high
 For these my enemies : and if a chill
 Of indignation has oppress'd my mind,
 It was but transitory." * * *

In further illustration, I shall insert a letter already published by Dr. Paris, in which the principal attempt to deprive him of the honour of the discovery is represented in its true light.

" To J. G. Lambton, Esq.

" Queen Square, Bath, October 29. 1816.

" MY DEAR SIR,

" The severe indisposition of my wife has altered my plans. Your letter slowly followed me here.

" Mr. — is one of the persons who, after I had advanced a principle of security for a lamp, came upon the ground to endeavour to jockey me. I was not looking to a prize; I merely came forward to show an animal, the breed of which might be useful, when Mr. —, Dr. —, &c. brought their sorry jades, which had never before been seen or heard of, to kick at my blood mare.

*" I never heard a word of George Stephenson and his lamps till six weeks after my principle of security had been published; and the general impression of the scientific men in London, which is confirmed by what I heard at Newcastle, is, that Stephenson had some loose idea floating in his mind which he had unsuccessfully attempted to put in practice till after my labours were made known: then he made something like a safe lamp, except that it is not *safe*; for the apertures below are four times, and those above twenty times too large. But even if Stephenson's*

plans had not been posterior to my principles, still there is no analogy between his glass exploding machine and my metallic tissue, permeable to light and air and impermeable to flame.

“ I am very glad that you attended the meeting ; your conduct at no very distant period will be contrasted with that of some great coal proprietors, who find reasons for their indifference as to a benefit conferred upon them, in insinuations respecting the claims of Dr. Clanny, Mr. Stephenson, and others.

“ When men resolve to be ungrateful, it is natural that they should be illiberal ; and illiberality often hardens into malignity.

“ I shall receive any present of plate under your auspices, and those of the committee over which you preside, with peculiar satisfaction. It will prove to me that my labours have not been disregarded by men of whose good opinion I am proud.

“ I hope you will not blame me for not taking any notice of the attacks of my enemies in the North. I have no desire to go out of my way to crush gnats that buzz at a distance, and do not bite me, or to quarrel with persons who shoot arrows at the moon, and believe that because they have for a moment intercepted a portion of her light they have hit their mark. I am sensible to the circumstances under which you attended the meeting.

“ I offer you my sincere congratulations and ardent wishes that you may enjoy all possible happiness.

“ Believe me, &c.

“ H. DAVY.

He did not fail to distinguish between the carping of a small number of disingenuous persons, whose

low interests were their stumbling block, and the approval with admiration and gratitude of all those whose approbation he valued,

He observes :—“ It would be expecting too much from human nature to suppose that there should be no instances of obstinacy in workmen, and of prejudice or indifference in coal owners ; but these instances have been solitary ones ; and if delicacy did not forbid me, I might appeal to the letters of thanks of various individuals, and of the united colliers of Whitehaven ; to the vote of thanks of the coal trade of the North of England, of the grand jury of Durham, of the Chamber of Commerce at Mons ; and, above all, to the present made to me at Newcastle in so flattering a manner, October 11. 1817.”

This present was a service of plate of the value of about 1200*l.* on the centre piece of which was the following inscription :—

“ NEWCASTLE-UPON-TYNE, 1817.

“ THIS SERVICE OF PLATE WAS PRESENTED
TO SIR HUMPHRY DAVY BY THE SUBSCRIBERS,
AS A TOKEN OF GRATITUDE FOR HIS INVALUABLE INVENTION
OF THE SAFETY LAMP.”

Underneath were the subscribers' names :—

“ The Duke of Northumberland.
The Lord Bishop of Durham.
The Dean and Chapter of Durham.
Sir Ralph Noel, Bart.
John Geo. Lambton, Esq., M.P.
Thomas H. Graham, Esq.
George Silvertop, Esq.
Dixon Brown, Esq.
Matthew Russell, Esq. Walls End Colliery.
Owners of Hebburn Colliery.
Owners of Percy Main Colliery.
Owners of Heaton Colliery.

Owners of Jarrow Colliery.
 Samuel Williams, Esq. and Co., Cox Lodge Colliery.
 Owners of Fewden Colliery.
 Owners of Manor Walls End Colliery.
 Owners of Townley Main Colliery.
 Owners of Sheriff Hill Colliery.
 Owners of Boswich Main Colliery.
 Owners of Benwell Colliery.
 Owners of Pontop Colliery.
 Wm. M. Pitt, Esq., Tanfield Moor Colliery.
 Christopher Blackett, Esq., Wylton Colliery.
 Owners of Welbottle Colliery.
 Owners of Hartley Colliery.
 Owners of Glawick Colliery.
 Morton J. Davidson, Esq., Beamish Colliery.
 John George Lambton, Esq., M. P., Lambton Colliery
 Lady Frances Anne Vane Tempest, Eden Main Colliery.
 Warren Maude Lamb, Esq.
 Mr. William Stabant, jun., Talfeld Colliery.
 J. D. Nesham, Esq. and Co., Nesham Main Colliery.
 Matthew Russell and Co., Wasington New Colliery.
 John Carr, Esq., Oxetone Colliery.
 Mr. John Humble, Lee-field Colliery."

The flattering manner in which this mark of grateful feeling was shown at Newcastle, alluded to in the above passage, requires to be noticed : it was at a public dinner, to which he was invited by the associated coal owners, on his return from Scotland, in September, 1817. Mr. Lambton (now Earl of Durham), who presided on the occasion, thus addressed him : —

" Sir Humphry, — It now becomes my duty to fulfil the object of the meeting, in presenting to you this service of plate, from the coal owners of the Tyne and Wear, as a testimony of their gratitude for the services you have rendered to them and to humanity.

" Your brilliant genius, which has been so long employed in an unparalleled manner, in extending the boundaries of chemical knowledge, never ac-

complished a higher object nor obtained a nobler triumph.

“ You had to contend with an element of destruction which seemed uncontrollable by human power ; which not only rendered the property of the coal owner insecure, but kept him in perpetual alarm for the safety of the intrepid miner in his service, and often exhibited to him the most appalling scenes of death and heart-sickening misery.

“ You have increased the value of an important branch of productive industry ; and, what is of infinitely more importance, you have contributed to preserve the lives and persons of multitudes of your fellow-creatures.

“ It is now nearly two years that your safety lamp has been used by hundreds of miners, in the most dangerous recesses of the earth, and under the most trying circumstances. Not a single failure has occurred ; its absolute security is demonstrated. I have, indeed, deeply to lament more than one catastrophe, produced by foolhardiness and ignorance, in neglecting to use the safeguard you have supplied ; but these dreadful accidents, even, if possible, exalt its importance.

“ If your fame had needed any thing to make it immortal, this discovery alone would have carried it down to future ages, and connected it with benefits and blessings.

“ Receive, Sir Humphry, this permanent memorial of our profound respect and high admiration ; a testimony, we trust, equally honourable to you and to us. We hope you will have as much pleasure in receiving as we feel in offering it. Long may you live to use it ; long may you live to pursue your splendid

career of scientific discovery, and to give new claims to the gratitude and praise of the world ! ”

He replied : —

“ Gentlemen, I feel it impossible to reply, in an appropriate manner, to the very eloquent and flattering address of your distinguished chairman. Eloquence, or even accuracy of language, is incompatible with strong feeling ; and on an occasion like the present, you will give me credit for no small degree of emotion.

“ I have been informed that my labours have been useful to an important branch of human industry connected with our arts, our manufactures, commerce, and national wealth. To learn this from such practical authority, is the highest gratification to a person whose ardent desire has always been to apply science to purposes of utility.

“ It has been also stated, that the invention which you are this day so highly honouring has been subservient to the preservation of the lives and persons of a most useful and laborious class of men : this, coming from your own knowledge, founded upon such ample experience, affords me a pleasure still more exalted ; for the highest ambition of my life has been to deserve the name of a friend to humanity.

“ To crown all, you have, as it were, embodied these sentiments in a permanent and magnificent memorial of your good opinion. I can make only imperfect and inadequate efforts to thank you.

“ Under all circumstances of my future life, the recollection of this day will warm my heart ; and this noble expression of your kindness will awaken my gratitude to the latest moment of my existence.”

And on sitting down his health having been drunk with "three times three," he spoke as follows : —

"Gentlemen, I am overpowered by these reiterated proofs of your approbation. You have overrated my merits. My success in your cause must be attributed to my having followed the path of experiment and induction discovered by philosophers who have preceded me : willingly would I divide your plaudits with other men of science, and claim much for the general glory of scientific discovery in a long course of ages.

"Gentlemen, I might dwell at some length upon the great increase of wealth and power to the country within the last half century, by scientific invention, which never could have existed without coal mines : I shall refer only to the improvement in the potteries, to the steam-engine, and to the discovery of the gas lights.

"What an immense impulse has the steam-engine given to the arts and manufactures ! How much has it diminished labour, and increased the real strength of the country, far beyond a mere increase of population ! By giving facilities to a number of other inventions, it has produced even a moral effect, in rendering capital necessary for the perfection of labour, credit essential to capital, and ingenuity and mental energy a secure and dignified species of property.

"Science, Gentlemen, is of infinitely more importance to a state than may at first sight appear possible ; for no source of wealth and power can be entirely independent of it ; and no class of men are so well able to appreciate its advantages as that to which I am now addressing myself. You have not

only derived from it the means of raising your subterraneous wealth, but those also of rendering it available to the public.

“ Science alone has made pit-coal such an instrument in the hands of the chemist and mechanic ; it has made the elements of fire and water perform operations which formerly demanded human labour ; and it has converted the productions of the earth into a thousand new forms of use and beauty.

“ Gentlemen, allow me to observe in conclusion, that it was in pursuing those methods of analogy and experiment, by which mystery had become science, that I was fortunately led to the invention of the safety lamp. The whole progress of my researches has been registered in the “ Transactions of the Royal Society,” in papers which that illustrious body has honoured by their biennial medal, in which I can conscientiously assert, that I have gratefully acknowledged even the slightest hints or offers of assistance which I have received during their composition.

“ I state this, Gentlemen, not from vainglory, but on account of certain calumnious insinuations which have arisen, not in the scientific world — for to that the whole progress of my researches is well known— but in a colliery. I must ever treat these insinuations with contempt ; and after the honest indignation which has been expressed against them by the coal owners in general, I cannot feel any anxiety on the subject ; nor should I have referred to it at all, did I not believe that the very persons amongst whom these insinuations originated were extensively benefited by, and were constantly using, the invention they would seek to disparage. I could never have

expected that such persons would have engaged their respectable connections in mean attempts to impeach the originality of a discovery given to them in the most disinterested manner, and for which no return was required but an honest acknowledgment of the benefit, founded upon truth and justice.

“ I do not envy them their feelings, particularly at the present moment. I do not wish to inquire into their motives. I do hope, however, that their conduct has been prompted by ignorance rather than by malevolence, by misapprehension rather than by ingratitude.

“ It was a new circumstance to me that attempts to preserve human life, and to prevent human misery, should create hostile feelings in persons who professed to have similar objects in view.

“ Gentlemen, I have had some opposition, much labour, and more anxiety during the course of these researches ; but had the opposition, the labour, and the anxiety been a thousand times as great, the events of this day would have been more than a compensation.”

Besides this present from the coal owners, he received also a splendid silver-gilt vase from the late Emperor Alexander of Russia, accompanied by a letter from the Emperor himself expressive of his sentiments in relation to his important discovery ; and further, by his own sovereign, a baronetcy was conferred on him in 1818.

He was urged by many of his friends to take out a patent for the safety lamp ; but such a measure did not accord with his feeling of propriety, — was not suitable to his views of the dignity of science : he preferred making it a gift to his country. Mr. Buddle,

than whom no one could more justly appreciate the value of his invention, was, as he himself states, one of these friends.*

"I felt," he says, "that he did not contemplate any pecuniary reward; and in a private conversation, I remonstrated with him on the subject. I said, 'You might as well have secured this invention by a patent, and received your five or ten thousand a year from it.' The reply of this great and noble-minded man was — 'No! my good friend, I never thought of such a thing: my sole object was to serve the cause of humanity; and if I have succeeded, I am amply rewarded in the gratifying reflection of having done so.' I expostulated (Mr. Buddle continues), saying his idea was much too philosophic and refined for the occasion. He replied, 'I have enough for all my views and purposes: more wealth might be troublesome, and distract my attention from those pursuits in which I delight. More wealth,' he added, 'could not increase either my fame or my happiness. It might undoubtedly enable me to put four horses to my carriage; but what would it avail me to have it said that Sir Humphry drives his carriage and four?'"†

Here it was my intention to have closed this chapter; but I am induced to make an addition to it in consequence of misstatements, which have

* If a patent could have secured a uniform and correct construction of the safety lamp, it is to be regretted that my brother did not give his invention the advantage of such a protection against counterfeits, merely with a view to the public good, and for the sake of humanity; for I have been well informed that in too many instances the proprietors of collieries, intent on a miserable economy, have procured and employed cheap lamps nowise safe, made by uninformed artists ignorant of the true principle on which the safety of the invention depends.

† Letter from Mr. Buddle, 1830, in Dr. Paris's work.

appeared from time to time in the public prints, depreciating the safety lamp, and calling its efficacy in question on the occasion of explosions in coal mines, which, it is asserted anonymously, the lamp did not prevent. For the sake of humanity, that the public may be led astray as little as possible by these false accounts, I shall introduce two communications on the subject from Mr. Buddle, whose statements, so forcibly and clearly given, are admirably adapted to carry conviction to doubting minds, and correct the mischief likely to result from any want of confidence amongst the inexperienced. I confess, too, that I have another motive for introducing these communications in my work—the pleasure they have given me in perusal, from the warm and kind-hearted manner in which the writer's regard and admiration of the inventor of the lamp are expressed, and the strong evidence he furnishes of the vast importance of the invention to mankind, in an economical point of view, connected with one of the principal sources of our national wealth.

The first communication I shall give is a letter to Sir Cuthbert Sharp, written in 1830, extracted from Dr. Paris's work; the second is of a later period, a letter addressed to myself, with which Mr. Buddle favoured me, when disturbed by such reports as have been just alluded to, questioning the safety of the lamp. This last valuable letter is accompanied by an extract from Mr. Buddle's journal, showing how an explosion may take place owing to accident, and which ignorance might attribute (as no doubt has been done) unjustly to defectiveness of principle in the lamp itself.

" To Sir Cuthbert Sharp.

" Newcastle, August 28. 1830.

" MY DEAR SIR CUTHBERT,

" I return Dr. Paris's letter, and I shall briefly answer his inquiries.

" If the Davy lamp was exclusively used, and due care taken in its management, it is certain that few accidents would occur in our coal mines; but the exclusive use of the 'Davy' is not compatible with the working of many of our mines, in consequence of their not being workable without the aid of gunpowder.

" In such mines, where every collier must necessarily fire on the average two shots a day, we are exposed to the risk of explosion from the ignition of the gunpowder, even if no naked lights were used in carrying on the ordinary operations of the mine.

" This was the case in Jarrow colliery, at the time the late accident happened. As the use of gunpowder was indispensable, naked lights were generally used; and the accident was occasioned by a 'bag' of inflammable air forcing out a large block of coal in the face of a drift from a fissure, in which it had been pent up, perhaps from the creation, and firing at the first naked light with which it came in contact, after having been diluted down to the combustible point, by a due admixture of atmospheric air.

" As to the number of old collieries, and old workings which have been renovated, and as to the quantity of coal which has been and will be saved to the public by the invention of the 'Davy,' it is scarcely possible to give an account or to form an estimate. In this part of the country, Walker's colliery,

after having been completely worked out, according to the former system, with candles and steel mills, and after having been abandoned in 1811, was re-opened in 1818, by the aid of 'the *Davy*,' and has been worked on an extensive scale ever since, and may be continued to be worked for an almost indefinite period.

"Great part of the formerly relinquished workings of Walls End, Wellington, Percy Main, Hepburne, Jarrow, Eldswicks, Benwell, &c., as well as several collieries on the Wear, have been recovered, and are continued in work by the invention of the *Davy*."

"If I had only—what you know perfectly well I have not—*time*, I could write a volume on the subject.

* * * * *

"Believe me, my dear Sir Cuthbert, to remain

"Yours very faithfully,

"JOHN BUDDLE."

"To John Davy, Esq. M.D.

"Walls End Colliery, 4th Dec., 1833.

"SIR,

"In compliance with your desire, communicated to me by a letter which I have received from Mrs. Fletcher through our mutual friend Mr. Turner, to give you my *present opinion* of the efficacy of the safety lamp, invented by your late lamented brother, Sir Humphry, I have the satisfaction to state that my opinion of its entire efficacy and safety, except from accidents, against which no human power can protect it, remains perfectly unchanged.

"I have now had more than eighteen years' experience, in extensive practice, of this most invaluable coal-mining utensil, the invention of which alone is

sufficient to immortalise the fame of its distinguished inventor in the annals of science, even if no other invention had sprung from his fertile genius to waft his scientific fame down to the latest posterity.

“ During the period above alluded to, I have had hundreds of the ‘Davy lamps’ in daily use in the various collieries under my inspection, and have seen them tried in all the variety of circumstances incidental to our fiery mines, over and over again, and have the satisfaction to say that during this whole period I have not known or heard of a single accident having happened from any defect in the principle of the lamp ; and I can assert, without fear of contradiction, that every one who has had experience of the use of the Davy lamp will bear me out in this statement. All that is necessary to ensure perfect safety in the use of the Davy lamp, in all the varieties of explosive mixtures which I have ever met with in coal mines, is simply to attend to the instructions given by its lamented inventor : his penetrating genius foresaw all the contingencies to which it might eventually be exposed, and pointed out the remedy.

“ I have known several fatal accidents occur from explosion where the ‘Davys’ were used ; but in every case, where the cause of the explosion could be traced, it was invariably found not to have occurred from any defect in the principle of safety established by Sir Humphry. It is true that explosions have occurred from negligence or accidents happening to the lamp ; but I am enabled confidently to state, on the strength and test of the experience I have had, that nothing has ever occurred to afford grounds for impugning the principle of safety. In conclusion, I would observe, that perhaps there can hardly be a

more satisfactory proof of the safety of the Davy lamp, than that many hundreds of people, as well as myself, have used it for so long a period, in all degrees of explosive mixture incidental to our mines, without having experienced a single accident from it. Only one accident has occurred in this colliery from the Davy, which was attributable to accident; and I inclose a copy of the minutes of the circumstance, as entered in my journal at the time, to show how accidents may happen which no human power can guard against.*

* *Extract from J. Buddle's Journal.*

" Walls End Colliery, Wednesday, Aug. 5th, 1818.

" An explosion took place in the N. E. *jenking drifts*, going from the G towards the F pit, about three o'clock this afternoon. William Reay and Ra Waggett, *hevers*, and J. Nesbitt and John Elliot, boys, were working in the drifts at the time.

" The explosion was a very smart one, and W. Reay only survived it; the other three being severely burnt, and suffocated. W. Reay was also most dreadfully burnt, and only survived the accident twenty-six hours. He was quite sensible and collected after the accident, although in the greatest agony, and gave me the following account of the matter:

" His '*Davy*' wanting oil, he sent the boy Nesbit *out by* to the crane with it to get it replenished with oil. The boy did so, and returned with '*the Davy*;' when he had come within about twenty yards of the *face*, Reay observed that the inflammable air was burning furiously within the cylinder of the '*Davy*,' and called to the boy to run to him with it. The boy immediately began to run, but had not proceeded more than a few steps when he fell, and the explosion instantly took place.

" The shock was very smart, and knocked out one *stopping* and a *man door*, which caused the ventilation to fall yards short of the *face*; and although Reay got out with great difficulty, the after-damp was so strong, that no person could possibly get in to the assistance of the sufferers until the *stopping* and *man door* were repaired in a temporary manner. In less than two hours, the bodies of the three sufferers were got out; they were all severely burnt, and had been dead for some time."

" Thursday, 6th August, 1818.

" I went this morning to investigate and examine the state of '*the Davys*,' particularly that from which the explosion happened. No person had seen them since the accident.

" I found that at which the explosion took place, in the *stenting* near

"I assure you, Sir, that, although I have not the pleasure of knowing you personally, it will give me pleasure to cultivate the acquaintance of one so nearly related to the eminent person whose memory has led to this communication, — one whom, in life, I truly esteemed, and whose memory I shall revere to the last moment of my existence.

"I am, Sir,

"Yours faithfully,

"J. BUDDLE."

I shall add one letter more from Mr. Buddle, with which he has recently favoured me, written after the last dreadful explosion in the Walls-End Colliery, and after the sitting of a select committee of the House of Commons, having for its object, to make inquiry relative to accidents in coal mines. Mr. Buddle's letter was in reply to one which I addressed to him, begging to be informed if the cause of the explosion above alluded to had been discovered, and if there were any just grounds for suspecting that in that catastrophe the safety lamp had been in

the *jenkin* described by Reay. It had received a blow on one side, which had bulged the bottom of the gauze cylinder down with the brass collar. The copper ring in the inside of the gauze cylinder was also bulged and twisted, and loosened. On close inspection, an aperture was found between the outside of the gauze cylinder and the brass collar, apparently occasioned by the bulge in the gauze, large enough to admit the point of an awl, through which I have no doubt the explosion passed. All the other lamps, four in number, were in a perfect state, and the whole of them were locked.

"John Thompson, the lamp keeper, declared that the 'Davys' were all in the most perfect state of repair when he delivered them *locked* to the drifters at the beginning of their shift, particularly Wm. Reay's, which had a new gauze cylinder put to it the preceding day. These drifts have all along been very *foul*, and Jos. Lowrie (overman) states them to have been cleaner on the morning of the accident than usual."

fault, as had been confidently asserted in some of the journals of the day.

“ Walls End Colliery, 21st August, 1835.

“ DEAR SIR,

“ I had the pleasure to receive your letter of the 10th instant, on returning here yesterday, after a few days' absence. I shall be happy to contribute any thing and every thing in my power to do justice to the memory of our lamented friend, with respect to his inimitable invention of the safety lamp, and to rescue it from the shade which certain pretenders are endeavouring to throw over it. But all these ephemeral attacks will pass away as a cloud, and the *original Davy lamp* will maintain its ground, and the memory of its immortal author be revered for ages, after all those would-be inventors, scientific twaddlers, and nibblers at his fame are forgotten. I endeavoured, as far as I was able, in my last examination in the committee of the House on accidents in coal mines, to do ample justice to the invention of the ‘Davy,’ and only regret that the important task was not committed to abler hands. I, however, endeavoured to do my best; and when the evidence is published, I hope you will find the facts therein stated useful to your object as well as satisfactory to your feelings, as so near a relation to that able and excellent man, to whom the scientific world is so much indebted, and whose premature loss it has to deplore.

“ In the evidence above alluded to, I stated that after nearly twenty years' experience of ‘the Davy,’ with from 1000 to 1500 in daily use, in all the variety of circumstances incident to coal mining, without a single accident having happened which could be

attributed to any defect in its principle, or even in the rules for its practical application, as laid down by Sir Humphry Davy,—I maintained that ‘THE DAVY’ approximated perfection as nearly as any instrument of human invention could be expected to do.

“ We have ascertained distinctly that the late explosion in this colliery did not happen in that part of the mine where ‘the Davys’ were used. They were all found in a perfect state after the accident — many of them in the hands of the dead bodies of the sufferers.

* * * * *

“ I am, my dear Sir,

“ Very respectfully yours,

“ JOHN BUDDLE.

“ J. Davy, Esq. M.D.”

Till the minutes of the evidence collected by the parliamentary committee be published, this letter of Mr. Buddle’s will, I trust, be satisfactory to all practical men. Men of science, I hope, do not require any additional evidence in relation to the safety of the lamp, inasmuch as they well know that in accordance with its principle, it can be constructed to be as perfect a barrier against the most inflammable mixture of oxygen and hydrogen, or of olefiant gas and oxygen, as against the most feebly explosive mixture that ever occurred in a colliery.*

* Whilst this sheet was in the press, the Reports from the Select Committee alluded to in the text, together with the minutes of evidence collected by them, extending to 320 folio pages, have been put into my hands. I shall give one extract only from the report, partly on account of the acknowledgement contained in it, of the benefits derived from the safety lamp, and partly on account of a misapprehension relative to the principles of the invention.

"Your Committee have endeavoured to investigate with strict impartiality the merits of the different lamps which have been brought under their notice. In the course of the evidence, many varieties will be found described. The invention claimed by the late Sir Humphry Davy, on principles demonstrated by that able philosopher, may be considered as having essentially served the mining interests of this kingdom, and through them contributed largely to the sources of national as well as individual wealth. Many invaluable seams of coal never could have been worked without the aid of such an instrument; and its long use throughout an extensive district, with the comparatively limited number of accidents, proves its claim to be considered, under ordinary circumstances, a safety lamp. The principles of its construction appear to have been practically known to the witnesses, Clanny and Stevenson, previously to the period when Davy brought his powerful mind to bear upon the subject, and produced an instrument which will hand down his name to the latest ages."

That the principles of the construction of the wire-gauze safety lamp were known to Dr. Clanny and Mr. Stevenson, before its invention by my brother, cannot be admitted nor maintained, — nor is it just to insinuate it. The principles of these gentlemen's lamps were totally different; and it is an abuse of language to say they were practically the same, merely because their object was to confine flame, — as must necessarily be the aim of every kind of safety lamp attempted, in which the source of light is flame.

CHAPTER II.

FURTHER CHEMICAL RESEARCHES. — LETTERS TO HIS MOTHER. — EXTRACTS FROM HIS NOTE-BOOKS, PHILOSOPHICAL, RELIGIOUS, AND POLITICAL. — REMARKS ON THEM. — A SPECIMEN OF HIS PHILOSOPHICAL POETRY.

THE preceding researches on fire-damp and flame were brought to a close in the beginning of 1817. During the following year my brother communicated to the Royal Society two papers,—one “On the Fallacy of Experiments in which Water is said to have been formed by the Decomposition of Chlorine;” the other, “New Experiments on some of the Combinations of Phosphorus.” In the first he showed, by simple and decisive experiments, that the error of conclusion relative to the production of water and the decomposition of chlorine arose from overlooking the nature of the vessels used, the impurities present, and the effects of complicated attractions. In the second, he determined many doubtful points relative to the combinations of phosphorus with oxygen and chlorine; and more especially the proportions of phosphorus and oxygen in phosphoric acid. This he was able to do with unusual accuracy by an ingenious contrivance of confining the highly inflammable body in a glass tube with a small orifice, and heating it in a measured quantity of oxygen gas. The phosphorus, by the heat, was converted into vapour, and burnt as a gas in the atmosphere of oxygen, in a regulated gentle manner, insuring its

complete combustion; and the oxygen absorbed indicated the exact quantity that enters into the composition of phosphoric acid.

Between the spring of 1815 and of 1818, he made several journeys to the north of England, and into Scotland, partly in connection with his researches relative to fire-damp, but chiefly for the sake of fishing and shooting; and one of these excursions extended as far as the Orkney Islands.

Of the letters which he wrote during this period to his family, there are but few remaining, and they are chiefly confined to family matters, in which he always continued to take a lively interest, and retain all his early feelings. They are invariably kind and affectionate, and sometimes contain sentiments which to a pious and affectionate mother must have been very delightful. Thus in one, dated Kirkwall, Orkney Islands, August 12., after having freely given his opinions on a subject of some anxiety and doubt, he adds, "I trust, my dear mother, that you will not have any anxiety in consequence of my opinions on this subject. It is our duty to make the best we can of this world; and there is a Power far above our comprehension, who may produce good out of what appears for the moment an evil, and who never forsakes those who deserve well."

In only two of these remaining letters does he allude to the safety lamp. Thus in one to my mother, dated Bath, October 27. 1816, evidently in reply to some inquiries, he writes, — "It is true that the colliers are getting made for me a piece of plate. I know not the value of it, nor do I care much; it is not to be less than 1000 guineas. But it is the nature of the present, for saving the lives of my

fellow-creatures, that I value." And in another, dated London, May 25. 1818, in which he acquaints her with his plans for another journey on the Continent, undertaken chiefly on account of two objects, —the extending of the use of the safety lamp, and the hope of benefiting literature by attempting by chemical means the unrollment of the Herculaneum MSS. :—

"MY DEAR MOTHER,

"We are just going upon a very interesting journey. I am first to visit the coal miners of Flanders, who have sent me a very kind letter of invitation and of thanks for saving their lives. We are then going to Austria, where I shall show Vienna to Lady Davy, and then visit the mines; and lastly, before I return, we are going to visit Naples.

"I have the commands of his Royal Highness the Prince Regent to make experiments upon some very interesting ancient manuscripts, which I hope to unfold.

"I had yesterday the honour of an audience from his Royal Highness, and he commissioned me to pursue this object in the most gracious and kind manner.

* * * * *

"We shall be absent some months. With kindest love to my sisters and my aunts,

"I am, my dear Mother,

"Your most affectionate Son,

"H. DAVY."

Before entering on an account of this journey, I shall give a selection of his thoughts and views on various matters, which are scattered through his notebooks kept during this period of his life, extending

from about the year of his marriage to the time to which the narrative has been brought.

“Persons of very exalted talents and virtues may be said to derive their patent of nobility directly from God ; and their titles are not registered in perishable court calendars, but written in the great histories of Nature or of Man.”

“Those brilliant and poetical works in which enthusiasm takes place of reason, and in which the human intellect exhausts itself, as it were, in imagination and feeling, resemble monstrous flowers, brilliant and odorous, but affording no materials of reproduction.”

“Men value most what is obtained with most difficulty and what is most uncommon ; and certain ancient superstitions have given an air of sanctity and veneration to trifles, so that in the world things are hardly ever valued according to their real worth. A moss-grown stone hallowed by some monkish legend is often adored, whilst a god produced by the genius of Phidias is neglected.”

“To look for moral codes and political axioms in works of a certain description, would be to look for the ancient history of nations in their mythology ; and to endeavour to trace the form and the laws of the motions of the sun in the clouds surrounding him at sunset.”

“We see the healthy activity and the happiness of social life with little or no interest ; but we are awakened by discordant states of it, and by all the

forms of misery. Those who confer benefits of the highest kind are neglected, whilst the persons who have most contributed to the misery of individuals are often exalted to the highest rank. An Attila, or a Genghiz Khan in miniature, are not uncommon. The dew descends from heaven, the sunbeam kindles life where it falls; but they are neglected; the earthquake, the volcano, and the tempest are registered: yet in our annals the quiet permanency of benefactions is well contrasted with the feverish transiency of the great and the terrible."

"I know no better subject for a useful and patriotic work than the display of the habits and pursuits of the English on the Continent. In France everything is pure selfishness; and the character of society, and even of the people, is well displayed in the Palais Royale. Every one there lives for himself; vice is exhibited in all its magnificence; and the luxurious repose of the sensualist is only diversified by the hopes and fears of the gambler. I can hardly imagine any thing more fatal to the exquisite sensibility and the amiable modesty of Englishwomen, than that life which brings them continually in contact with vice and folly. I have been shocked to see a young female, who at home would not venture even into the most refined society except upon the arm of her mother, in the "Café des Milles Colonnes," seated at table in the midst of a crowd of pickpockets, prostitutes, black-legs, and soldiers, exposed to the gaze of the licentious, and becoming the companion of persons the most abandoned."

Of the French at their revolution he writes, —

“ They did not, like the English patriots, kindle a sacred flame of liberty by the light of which they read their ancient law ; but they kindled a devouring flame of anarchy, calling it a fire of liberty, and fed it with all that was sacred in their religion and their law ; and after having burnt the records of their faith, they frantically danced round it, like a nation of savages, whilst the bleached and parched bones of victims seemed to show that a nation of cannibals had been celebrating a feast to Moloch.”

“ In minds of great power, there is usually a disposition to variety of pursuits, and they often attempt all branches of letters and science, and even the imitative arts ; but if they become truly eminent, it is by devotion to one object at a time, or at most two objects. This sort of general power is, like a profusion of blossoms on a fruit tree, a symptom of health and strength ; but if all are suffered to become fruit, all are feeble and bad ; if the greater portion is destroyed by accident or art, the remainder being properly nourished become healthy, large, and good.”

“ The advance of years brings indifference, and at the same time strength and steadiness. The young sapling is moved by every breeze ; shoots forth its leaves vigorously when favoured by dew and sunshine ; but is often severely injured, if not destroyed, by frosts. In the mature tree, as the heartwood is covered by many coatings of sapwood, it becomes compressed and harder ; but though it loses its vitality, it contributes to the strength of the vegetable.”

“ It is not that honours are worth having, but it is painful not to have them. A star gives consequence in the eye of the common world, and even those people who most affect to despise such external signs of court favour are often influenced by them. Honours are to true glory what artificial lights are to sunshine : they attract those eyes that are not fitted for sunshine. The bat and the moth fly towards the torch, and the eagle soars towards the heavens. But it may be said of artificial lights that they are useful to all eyes ; and when they are intended to illumine, and not to dazzle, their effect is excellent. Elizabeth was very chary in distributing her honours, and hence they were valued.”

“ In general the stream of court favour is like a stream in an alluvial country : the banks by which it is to be reached are muddy ; and whoever would drink of the waters must wade through dirt to reach them, and *stoop* for his draught.”

“ Our ministers attribute to themselves, to their councils and plans, the downfall of Bonaparte ; the Romish priests consider it as owing to their prayers and anathemas. Certainly a pious man, who regards heaven as influenced by prayer, may find more reason in the last than in the first ; for our ministers could have nothing to do with the frost of Smolensko, or with Bonaparte’s obstinacy after he had driven the allies from Troyes ; and before *that* Lord Castlereagh would have signed a peace, which would have offered breathing time to a man whose life was pledged for empire, and whose path to empire was the destruction of Britain.”

“ It is better to deserve honours and not to have them, than to have them and not deserve them.”

“ Pride makes men entertaining only to themselves : vanity makes them entertaining to others.”

“ It is in society as in nature — not the useful, but the ornamental, that strikes the imagination. The monstrous flower, which produces nothing, arrests the eye ; the modest and humble germ of the grain, the staff of human life, is passed by with neglect : but the one is the fancy of the florist, and fades, and dies, and disappears for ever ; the other is propagated from generation to generation, eternal in its use.”

“ The brilliant decorations which ornament the courts of Europe, those lights from mock suns and stars, are the creations of a moment ; but they cause more wonder than the rays from the real suns and stars. Men of the world look on the ground for reflected lights, and scarcely ever raise their eyes above to the lights in the heavens, and to the names that are written there, which are almost invisible, and have no greatness, save when they are seen through the telescope of time ; yet they are everlasting, and are viewed from all parts of the earth, and by all people.”

“ Science, unlike literature, is independent of taste or caprice.”

“ Whoever wishes to enjoy *peace*, and is gifted with great talents, must labour for posterity. In doing this, he enjoys all the pleasures of intellectual labour, and all the desire arising from protracted

hope. He feels no envy nor jealousy ; his mark is too far distant to be seen by shortsighted malevolence, and therefore it is never aimed at."

"To raise a chestnut on the mountain, or a palm in the plain, which may afford shade, shelter, and fruit for generations yet unborn, and which, if they have once fixed their roots, require no culture, is better than to raise annual flowers in a garden, which must be watered daily, and in which a cold wind may chill or too ardent a sunshine may dry."

"The best faculties of man are employed for futurity: speaking is better than acting*, writing is better than speaking. The politician is a creature of to-day; the philosopher a child of to-morrow: the one is like the upper surface of the water, changed by the wind, the cloud, and the sunshine; the other is like its depths, always tranquil and unchanged."

"Probably there is an analogy in all *existence*: the divided tail of the fish is linked in a long succession of like objects with the biped man. In the *planetary system* it is probable man will be found connected with a higher intellectual nature; and it is possible that the *monad*, or soul, is constantly undergoing a series of progressions."

"Our institutions may be regarded as the frames in which the web of social life is woven, where the warp of self-interest is crossed by the woof of feeling and reason, and in which the coloured or figured

* That is, theatrical acting,

threads may be regarded as those of sentiment; and so a stuff is framed, not only strong but likewise brilliant."

"When young shoots grow on a rotten trunk, the only way to save them is to detach them. Analogy—rotten aristocracies and governments, and young and vigorous life amongst the people."

"The works of scientific men are like the atoms of gold, of sapphire and diamonds, that exist in a mountain; they form no perceptible part of the mass of the mountain; they are neglected and unknown when it is entire; they are covered with vegetable mould, and by forests. But when time has sapped its foundation—when its fragments are scattered abroad by the elements, and its decayed materials carried down by rivers, then they glitter, and are found; then their immortality is known, and they are employed to ornament the diadems of emperors and the sceptres of kings. They press under them the brows of majesty. They lie too deep to be readily found. When sovereigns are at the expense of digging out these riches, they are repaid by seeing them gems in their crowns; and *they* shine imperishable, independent of their greatness and glory."

"The aspirations for immortality are movements of the mind similar to those which the bird makes with its wings before they are furnished with feathers."

"How much increase of riches, — coal mines, mineral treasures, increase of health by ventilation,

draining, &c. — increase of strength by gunpowder, steam engine, &c., characterise modern times ! These are imperishable. The strength of armies will pass away. It is not the thunder storm and the whirlwind, but the dews, the rain, and the sunshine, that fertilize the earth.”

“ God governs man by the simplest and most benevolent means, — hope and fear. The powers and affections of life cling even to the rudest and most turbulent characters, and the deeper we examine the more they are found. Thus, though the surface of the rock in the stormy sea and most rapid torrent is bare ; yet below the surface it is covered with vegetation, fed by the raging and foaming waters.”

“ Beware of too much prosperity and popularity. Life is made up of mixed passages — dark and bright, sunshine and gloom. The unnatural and excessive greatness of fortune of Alexander, Cæsar, and Napoleon ; — the first died after divine honours were paid him ; the second gained empire, the consummation of his ambition, and lost his life immediately ; the third, from a private individual, became master of continental Europe, and allied to the oldest dynasty, and after his elevation his fortune immediately began to fall. Even in private life, too much prosperity either injures the moral man and occasions conduct which ends in suffering, or is accompanied by the workings of the envy, calumny, and malevolence of others. These circumstances ought to reconcile us to calumny, envy, and misrepresentation. The universal voice of fame, popularity,

honour, &c. belong only to the dead or the dying.
See the beautiful lines on Pope, —

“ ————— That day, for come it must,—
That day shall we lament to see,” &c. —

“ In the exercise of intellectual power there is a high degree of enjoyment, which has compensated for the neglect, persecution, and imprisonment of the greatest men—Galileo, Roger Bacon, &c.

“ We know nothing at all of the plan or scheme of the universe, but we believe there is a plan. Consequently, events may in fact have a connection which appear to us the most unconnected and remote. If the popular and antiphilosophical view of omens, prophecies, and prodigies be correct, this is the only philosophical solution that can be given. The apparent ravings of Thomas the Rhymer, respecting the Mackenzie family, have no natural connection with the remarkable event of which I am an historical witness; no more than the rattling of the wheels of a carriage at an inn door with the death of poultry, which, however, we know is the remote cause. The chickens can as much fathom this, as we can the mysteries of our being and nature.”

“ Human life may be compared to mountain scenery in a cloudy and windy day, when the clouds cover more sky than is open. We wonder at the bright light, travelling rapidly along the surface of the mountain, and while we wonder it is gone. Now the distances appear in light, and now in shade; and parts of the horizon of futurity are bright in sunshine, and others dark in gloom. The hopes that we have

with respect to another state of existence may be compared to the reflections that we see in the sky, when we ourselves are in gloom, from a distant sunny country. We are conscious that there is a lighted surface in sunshine, though we are totally ignorant of the source of it."

"Our histories of past events are somewhat like the wrecks upon the sea beach: things are often thrown up because they happen to be light, or because they have been entangled in sea-weed; i. e. facts are preserved which suit the temper or party of a particular historian."

"The coming of the blast is shown by the noise of the distant wood. The philosopher knows that vibrations in the air travel infinitely quicker than its currents; and to him the circumstance is a scientific principle, whilst to the savage it is only a vague omen. So omens of every kind, if we could trace the long chain of causes and effects, would be either naturally associated symptoms or causes."

"To infinite wisdom the past, present, and the future are alike; and gleams of that wisdom are sometimes bestowed upon the meanest and most insignificant beings. Vultures assemble where battles are to be fought, and the carrion fly buzzed round Buckingham before he received the blow of the assassin."

"Believing in a *present* Deity. — I think we can hardly avoid referring instinct to his immediate influence, and of course the particular case is involved,"

“ In the beginning of all pursuits, sympathy or a desire of obtaining the approbation, or respect, or admiration of our fellow men, has the greatest influence over the mind ; thus we hunt, and fish, and shoot in society, and glory in success : at last, however, the pursuit itself becomes abstracted ; and this is fortunate, for we learn how selfish human nature is as we grow older.”

“ The miser knows that money is power, and that it represents almost all that is sought for, desired, and envied by mankind, and he is perfectly happy in increasing his latent power ; yet in reality he is as absurd as the man who should pass his life in accumulating gunpowder, because it is the instrument by which battles are won.”

“ May it not be imagined that the monads or spiritual germs which animate or create organic forms have no relation to space, and pass from systems to systems, wholly unlike matter, which is limited to its own gravitating sphere ? Is not light the first envelope of the monads, and may not my earliest hypothesis be true ? ”

“ What is true with respect to matter will probably with respect to spirit be absolutely false, as supposing organisation only the link or substratum of thought : all analogies will fail us from gross matter applied to light.”

“ Is there not a monad, or one perceptive atom or principle, which plays, as it were, round different arrangements in the brain, and which acts in its own

little world, as the great diffusive monad does in the universe? But how far beyond our power of conception! how we are lost! and how infinitely little of man and his thoughts becomes most evident!"

"Men who have considered nature only by what is visible, and who find in the forms and energies of matter the generation of thought, are like children, who may consider the motion and action of a steam engine as produced by solid matter; ignorant of the elements of fire and water, which are the immediate cause of its activity, or of the physical discoveries of human intelligence by which the combinations producing it were made."

"What is the instinct of animals but an immediate revelation? and they have more instinct in proportion as they have less reason. In the infancy of human society, man being a more perfect animal required more *moral instincts* or revelations to preserve his social existence. Now, even the rudest people are accessible to the more civilised, and special revelations are no longer necessary.

"It is quite certain that in these revelations no new ideas were given, and no new impressions received; even the supposed presence of Deity may have been an imagination of a human form, and the miracles delusions of the human mind, though clearly disposed to these delusions by the existence of the instinct; and this, indeed, is in accordance with the divine wisdom and power, as it is much more easy for mind to produce an ideal conviction of satisfied appetite, than to create a new quantity of matter, which must have been the case, if the few small loaves and fishes

had been sufficient to satisfy the multitude in the wilderness."

"If we suppose very high pressure, even organic compounds may exist under circumstances which would appear incompatible with them. If we suppose an aqueous vapour atmosphere swimming above our common atmosphere, and weighing a hundred times as much, and our atmosphere heated so highly that the pressure made it exactly of the same specific gravity as it now is, limestone might be fluid, and yet animals live in water; because their decomposition would not be more certain than it now is, and there would be very little difference in the surface, except in the fluidity of certain forms of matter, the extensive atmosphere, and the self-shining character of the globe.

"The force of attraction being so great in the sun, no decomposition or changes could take place, if there was not some compensating relative energy; so that if it be composed of matter like our earth, *life* could not exist upon it, unless its temperature were very elevated. The planets most distant from the sun are larger, but composed of lighter matter probably; for the same reason, it may be a matter more susceptible of expansion from heat."

"RELIGION. — INSTINCT.

"With respect to my ideas of revelation and instinct, it is as easy for the Supreme Intelligence to form a thinking being such as Newton, as a crystal, without the slow process of generation of body or mind."

“Adam’s first inspiration transmitted to his offspring. — Religious instincts may be hereditary, — moral excellencies and physical, as well as defects or diseases.”

LEVITES. — JEWS. — DOGS.

“The *quality*, disease, or virtue of *inspiration* may be dormant in many generations, and yet appear again, as in the case of animals with instincts destroyed by domestication, and in insanity, gout, &c., which sleep for three or four generations.”

“Is not the want of a religious instinct in the New Hollanders a proof that they are a distinct creation, as the kangaroo and *Ornithorhynchus paradoxus*?”

“One sees in all this why the Jews were kept a pure people, and not permitted to marry strangers.”

“Men cannot *image* or *typify* the feelings of religion; and the breathing of the Divine mind is still thrown upon sensible objects with which it cannot blend, but which it merely sets in motion. Like the pure air, which agitates equally the muddy pool, the clear lake, and the immense ocean, but is ever above them, and unmingled with them, it gives form to their waves, but does not change their substance; so inspiration can be made known to men only through terms connected with common life and popular ideas; and revelation must be an impulse of thought, or a peculiar association of ideas, and not a new creation of thought. Even in the Roman and Greek mythology, there seem to have been some vestiges or remains of this instinct.

“Prophecy or inspiration limited to particular

purposes, not giving omniscience, and necessarily blended with the false knowledge of the mind.

“Glimmerings of divine light seem often to belong to the weakest intellects, and to have been exhibited in recent times.”

“THOMAS THE RHYMER’S PROPHECY.

“Nothing so easy, in my theory, as to account for all the aberrations of the divine light, and even the necessity for this: its pure appearance in the primitive Christian church; its refractions by forms and ceremonies in the Romish church acting upon barbarians; the excessive zeal of the Reformers.

“Much of doctrinal absurdity in the freethinking or deistical school arises from Anthropogonism, as their supposing the divine mind similar to the human: but the largest and the smallest finite quantities are alike compared with infinity; and though there is a great difference between the intelligence of a Newton and an oyster compared with each other, yet there is none when either of them is compared with infinite wisdom. The destruction of a world and the crushing of a gnat are alike insignificant when compared with infinity; and to make infinite wisdom and goodness after our models is absurd — more so than to expect a preaching ant, or a writing bee.

“We must believe that whatever has been once sentient will be for ever sentient, and has been for ever sentient; but the human intellect is by divine wisdom made acquainted with the past only as it may be useful to guide to the future; but I have some idea that conscience is a habit of mind, resulting from a previous state of existence.

“The child has used all its senses before two

years old, and has cried and laughed, suffered and enjoyed; but all this is forgotten by the man. The oblivion of past being does not, however, destroy the consequences of its existence. The child forgets the accident of a fall, but the limb continues maimed. It will be no consolation to know that future punishment will be connected with an oblivion of the definite course of suffering.

“ It seems to be an axiom that what is *revealed* should be what cannot be attained by reason, and what often must be, or *appear* to be, contradictory to it.

“ What appears most desirable to the child, the gilded toy, is despicable to the man; and how little the child cares for the objects of the ambition of the man!

“ The flight of the quail and the migrations of the landrail are in fact miraculous, when the short habitual flight of these birds is considered.

“ The meteoric stones in our time are a miracle of nature.

“ Man is not intended to pry into futurity; and the occasional miracles and gleams of prophecy seem intended to demonstrate divine interference or power.

“ No mortal has seen any thing like creation, and no mortal being has received divine honours and lived long.—Alexander the Great — Captain Cook — Roman Emperors.

“ Nothing so fatal as excess of power or happiness. — Napoleon Bonaparte.

“ No proofs of the divine origin of Christianity in the purity of its doctrines, but decided proofs in the

manner in which it began to exist, and in the history of its progress.

“ It appears to me that the first process in an active and ingenious mind, when it begins to examine religious matters, is disbelief ; the next doubt ; the last belief. If we show the existence of something above experience or reason in animals, and prove from geological considerations man to be a recently created animal, then instincts will be necessary for his early existence ; and amongst these, religious instincts. Is it not probable that in the colder planets there is more intellectual life ? In proportion as our planet appears to have cooled, so in proportion has it been fitted for higher forms of animal life.

“ The number of moons round the distant planets, the belts of Jupiter, the ring of Saturn, all would require great intellectual power for the observation of their physical phenomena and determination of laws.

“ Darwin, in his ‘ Zoonomia,’ has endeavoured to prove that all instinct is reason. The fact of the ducks hatched under the hen instantly going to water overturns every thing he has written. There are myriads of other instances. The young turtles and crocodiles, hatched without care of parents, run to the water. The crocodile bites at a stick, if it be presented to it the moment it is hatched.

“ Habits that keep the mind in vigour are not formed in a small instant ; and the sources of our lasting pleasures must be sought for deeply. The annual flower has not a deep or long-continued root, and its bright bloom is for a summer’s week ; the

mighty oak that slowly rises, sends its roots as far as its branches, and the heavens and earth share it alike."

"We have no idea of the creation of living beings; for nothing analogous occurs in the history of nature, and we see nothing except the successive generations of living beings, all *ab ovo*; yet it is certain that there was a period when most of the existing generations did not exist, and when races of animals were in being that are now extinct. In the former order of things we find a multitude of fishes, a few amphibia, a few birds and quadrupeds; but amongst the remains of life, no marks of an intelligent race of beings that had altered the surface of the globe in the way that man has done. Has such a race existed before man? Probably not; for some of his works would have been destroyed with more difficulty than the bones of fishes or the skeletons of birds. This can only be said of that great change produced in the matter of the globe by water, and which seems to have preceded the present order of things. A change produced by fire would have destroyed every thing belonging to life, even its organised forms; and would have left, in the place of order, beauty, and intelligence, a mere crystalline arrangement, the result of the chemical attractions of matter. That this was the state of the globe which immediately preceded the first appearance of the animals whose remains exist in the aqueous formations, there is every reason to conclude; and that a destruction of the present order by fire may take place, is within the reach of probabilities.

"But can such be the disposition of things, that

the greatest and highest intelligence,— the results of the accumulated genius of man, operating through a long course of ages, and at length attaining something like perfection,— should disappear, and all the results be lost? Surely these results must attach to some other system, which belongs to a moral or intellectual scheme of things wholly different from the physical, and which coincides with the views belonging to Revelation.

“ Or, is even the highest perfection and aggregated power of the human mind a mere nothing compared with the immensity of intellectual combinations belonging to the universal mind,— a mere image in a dream, in relation to the whole living and acting universe? On all these subjects man is profoundly ignorant; yet some processes analogous to creation seem to have been recent. New Holland, for instance, contains races of animals found no where else on the surface of the globe; and it is impossible to believe either that they have been there from all eternity, or that they have been carried there by man.”

“ POLITICAL REFLECTIONS, 1816.

“ It would be easy to show what science has done, what she might do for statesmen, and what statesmen have lost by not employing philosophers, rather than empty-headed declaimers, and empty-pursed cadets from the aristocracy.

“ Had there been one philosopher in the P. C., the expedition to Walcheren would not have been undertaken. It required a mind as much in a fog as * * * not to know that the fogs of that country were pestilential at the season

when the expedition was undertaken. Any philosopher would have warned government against the importation of corn, which is now weighing down the country by a diminished circulation; and a tax upon foreign corn would have been preferred, not a maximum. There would have been no notes and no bankruptcies. Any philosopher would have taught government the usefulness of the present coinage, and would have advised them, instead of buying bullion by sinking paper, to have taken six millions of paper from the Bank, as a proper bonus for the immense sums laid out by that body upon the public. If coin was wanting, they should have obliged the Bank to furnish it.

“Were a philosopher in the cabinet, he could teach ministers that a general want of money must be felt; and that the general diminution of home consumption, as to every article of luxury, is the cause of the increase of the poor, and the misery of all classes which formerly supplied the consumer.”

“The national debt, at least that part of it incurred during the last war, — the greatest, the most astonishing part, — was principally employed in exciting industry and ingenuity at home. The money employed as subsidies must have been either raised ultimately from the labour of the people of these islands, or from produce sent to these islands, entered as a debt, to be paid with interest; but the foreign fundholders are very few: the debt then is principally due for the labour of the British. England does not produce gold and silver; therefore the productive labour which raised 500 millions must have been enormous. The national debt called forth all

the energies of ingenuity and industry. The gold we sent abroad was purchased by labour; and we sent abroad an immense quantity of produce, not of corn or wine, but of manufactured articles; the produce of our clays, our ores, and our wool. I am sure there is gross ignorance on every thing respecting this great question."

"The timid politician is like the timid physician; the one attempts, in every case, to meet the popular feeling; the other prescribes for symptoms. If a farmer neglect to cut his corn because there is a cloud in the sky, he will never have a harvest. In every kind of conduct general principles must be adopted."

"Every thing good in society has arisen from gradual reform and progressive change. When the leaves of the tree are blighted it kills the tree to pluck them off. Decaying leaves are better than no leaves at all: they should be suffered to perform their imperfect functions till they are thrown off by the vigour of the young and healthy leaves."

"The magnificence of a court, as long as funds can be found, and as long as the money is entirely expended in the country, is like brilliant sunshine, which in spring and summer raises the sap, causes it to circulate, the leaves to sprout, and the fruit to ripen; but in autumn, when the plant no longer receives any nourishment from the soil, it withers, dries up, and is destroyed."

"To raise money in a country, and spend that

money out of it, is like carrying off corn crops from a soil, — it must soon become barren.”

“ We hear the thunder, and unless we examine into the cause of it, some great catastrophe may take us unawares ; we must inquire whether it is from the heavens or the earth, — whether it is caused by a tempest, which may soon be dissipated, or whether it is the forerunner of a volcanic eruption, which may deluge us with burning lava, not with transient rain, and destroy for ever our wealth, our cities, and our palaces.”

“ The friends of revolution do not, like powerful spirits, ride on the whirlwind, and direct the storm ; they are generally the first victims of it. In endeavouring to sap the foundations of the building, they merely disturb some of the loose Gothic ornaments, which fall on their heads, and destroy the intermeddlers.”

“ That there is great distress and great discontent in the country, is at present a truth universally admitted. Even those persons who are most disposed to hope and to see objects in sunshine, consider the present crisis not only as replete with difficulty and danger, but as leading to despair. There is a cloud hanging over us, and persons are as much divided in opinion with respect to the causes as to the consequences of it. Some regard it merely as a summer cloud resulting from the sunshine of our peace ; others, as a winter cloud depending upon the chill of our taxation. Some expect it to be dissipated in a transient shower, and others hail it as the forerunner

of a deluge which is to sweep away our harvest, and to destroy our habitations. In such a season it is natural to look to the government, not only for information; but for comfort; but the persons at the head of affairs seem as little able to afford the one as the other. They have indeed talked of the inconvenience resulting from a transition to peace from war, and the 'ignorant impatience' of the people with regard to taxation; but such opinions, vague, unsatisfactory, and insolent, do not dissipate doubts, or awaken confidence. The peace they have given us may indeed be represented by an inverted and empty cornucopia, and the miserable are not likely to be soothed by being accused of impatience. To expect remedies from physicians who are ignorant of the nature of the disease they undertake to cure, is absurd. Nature, and a good constitution, might conquer the malady; but it is not likely that natural means will be allowed, and the constitution has been already tampered with. The patient, under such circumstances, is right to find other physicians, or to give up physic altogether. On an occasion when those who ought to *direct* the public opinion seem unable to influence it, and when they irritate rather than soothe the public mind, it becomes the duty of private individuals to lend their aid. If the stranger who 'fell among thieves' was not succoured by his own people and race, he could not refuse the aid of the Samaritan."

"Great proprietors and consumers consume in common years above an average quantity of produce, and therefore give premiums to agriculture; and in years of scarcity they diminish their consumption.

Their capital and their wants likewise excite to excellence in manufactures, and give facility to labour by exciting excellence. They keep the standard in the inventions belonging to common life, and the ruder arts as well as the more refined, higher. Could we approach nearer to an equality, the comforts, *i. e.* the general mass of them in society, would be diminished. The tendency of improvement is to elevate together all the classes of society. Revolutionary systems, which pretend to bring men nearer to an equality, may indeed bring them nearer to a state of nature, but not to a state of happiness. Unhappily, experience has shown that its tendency is to make men savages, not philosophers. It is like a contagious or destructive fire, which consumes the crop; and not like a genial light or heat, as of the sun, which nourishes and ripens it."

"An obvious effect of diminished circulation is, that people who before were luxurious consumers become frugal consumers."

"There is this immense benefit in machinery, that it carries on those operations which debase the mind and injure the faculties. A man by constantly performing the same operations, becomes unfit for any other. Machinery requires attention, intellectual exertion, and bodily labour of various kinds."

With these reflections I shall, for the present, conclude the extracts. In relation to those of a political kind, it should be kept in mind when they were written, at a time of great national distress, in 1816, just at the close of a long period of extraordinary exertion

and forced excitement—the conclusion of a long and unparalleled war; when the storm, indeed, was over, and the atmosphere was tranquil, but the agitation and swell of the ocean continued. His reflections may be worth preserving, as a record of this time; and they may deserve, too, being kept, as showing, at such a critical and difficult period, the opinions of an individual free from all party bias, and who regarded the then perplexing and anxious state of things very much in the light of a problem to be solved.

In regard to the preceding extracts generally, I may remark, that I have had a double object in publishing them; partly for the sake of the sentiments or information which are conveyed in them, without relation to their author; and partly and chiefly in relation to him, as tending to develope his intellectual character, his modes of thought and expression, and peculiarities of opinions and doctrines. For this latter purpose they appear to me exceedingly well adapted. All the extracts given may be considered (as some of them are called) “common-places,” views, opinions, and expressions, spontaneous productions of his mind at different times and on different occasions, and exhibiting the nature of his mind, as the branches, leaves, flowers, and fruit of a tree show the kind and quality of the particular tree to which they belong. They display, it appears to me, in a striking manner, the independence and elevation of his mind, the extent and variety of his views, his fervid imagination, and the poetical dress he delighted to clothe his ideas in; his powers of analogical reasoning and illustration, his exalted ideas of the nature of scientific glory, of the objects of science,

and of its important influence in society ; and his no less exalted views of the intellectual faculties of man, and his aspirations and hopes after immortality. They display, too, very remarkably, in conjunction with such exaltation, a reserve or diffidence, and distrust of human reason, and confession of its very limited powers and comparative littleness, coupled with unbounded faith in the power and beneficence of the Supreme Intelligence. They contain the elements of all that is peculiar in doctrine in his last work, the "Consolations in Travel," especially relating to the instinctive quality of religious and moral feeling. I trust no apology is necessary in amplifying somewhat on this subject of such vast importance and interest, not only as regarding the future but even the present condition of man. He considered his religious views very much in this light : he believed that the only firm foundation of natural religion is instinctive feeling ; that there is a sense in regard to religion, as there is in regard to colour, sound, tastes, or smells, or as in regard to the propensity for society, and the ties of kindred and family ; that they who have the taste or instinctive feeling will be religious, obeying the impulse of their natures, and see a Supreme Intelligence governing the universe by fixed laws, and will worship this Intelligence in its power and goodness displayed in all the works of creation ; whilst those (if any such there be) who are destitute of the feeling, can no more acquire a sentiment of religion than a blind man can a notion of colours, or the deaf of sounds, and that, consequently, like the brute animal, their desires must be very much bounded by the present, and will be low and grovelling,—no hopes beyond the grave,—no aspirations after immortality,

no fervent, however humble, longings after the perfecting of their nature, the exaltation of intellect, the purifying of sense, and, in brief, the acquirement of a glorified nature, such as we imagine belongs to angelic beings, and to the "spirits of the just made perfect." How much more satisfactory, I may remark (at least as it appears to me), is this foundation of natural religion as an instinctive feeling peculiar to human nature, than the ordinary foundations which are laid by human art, the best of which are liable to cavil and objection, and to serious objection even on the ground of fair reasoning! The analogy of design is always adduced as one of the strongest arguments of a Creative Intelligence and Divine First Cause. Is this even satisfactory? It appears to me not. Granted that design indicates intelligence; that a watch is a proof of a maker; that the superior mechanism of man points to a higher inventive power and intelligence; are we to stop here? May we not go on with the process of analogical reasoning *ad infinitum*, and ask, must not the mind which created man and the universe, that small and this vast system of wonderfully adapted parts, bear stronger marks even of design and intelligence, and have been itself created by a power and intellect as much above it as it is above man and the universe, or as man is above any of the works of his own hands? Analogy may lead to a probable conclusion, but never to a certain conclusion; it is speculative, shadowy, and uncertain, neither compelling assent or conviction. Not so the instinctive feeling. It is imperative and compulsive: the brooding hen deprived of eggs will sit on pebbles; a people immersed in ignorance will worship idols, or in a comparatively enlightened state inscribe an altar

to the "Unknown God," and so indulge their instinctive feelings of veneration and worship of a Supreme Intelligence, ready with avidity, like Dionysius the Areopagite, and the "woman named Damaris," to receive the words of Paul, and transfer their belief, and veneration, and worship, to the living God. I dwell on this topic the more earnestly, on account of its deep interest, and because I hope that a feeling which was evidence to such a mind as my brother's may be satisfactory evidence to other minds. In science he employed a severe logic, and pushed it further than most of his contemporaries, and made discoveries by so doing, almost as much as by following the guidance of analogies, sounding as he went, and the more on his guard the greater the intricacies of the passage and the danger of the unexplored seas. Had he found that analogy would have aided him in his religious researches, he would naturally have availed himself of such a help, which he understood so well how to use: had he found that abstract reasoning would have conducted him to the object of his wishes, no doubt he would have employed it; but finding his belief or feeling on the subject of natural religion very much stronger than analogical reasoning warranted, or a severe logic permitted, he, probably, put them both aside, and at once boldly and honestly declared, — "This feeling which I have is instinctive; it belongs to my nature, and was intended for noble and exalting purposes;" and he associated with this feeling, and so strengthened it, a conviction of the vast superiority of instinct in its results, as witnessed in the lower animals over reason as witnessed in the operations of man, often so erring and delusive, and often leading to such monstrous results. He asso-

ciated it with the persuasion of the intellectual spiritual nature of man, and, consequently, of the imperishable and immortal nature of his spiritual essence. And he connected it with the belief that there are Divine revelations, and that there is a Divine system of religion adapted to all conditions of man, all states of society, and all regions of the globe; and that this religion is the Christian, which meets all the wants of man, checks his bad passions, cherishes his good feelings, exercises a wholesome discipline over the mind, requiring submission and belief, refining what is gross and sensual and exalting what is spiritual, confirming the natural longings after immortal life, and converting the aspiration and hope of immortality into a glorious certainty. He was always, on principle, averse and hostile to a system of materialism. He considered it neither congenial nor beneficial to our natures, or capable of any satisfactory proof; and in very many places he has expressed himself strongly on the subject, and especially in his last work, "Consolations in Travel." There seems, indeed, an absurdity in an intellectual being, such as man, adopting a material system, and renouncing a spiritual or ideal one. I do not understand how he can advance a single step in this system; how he can explain a single idea as relates to its origin. An idea, it must be admitted, is not material; and to say that it is produced by something unknown acting on something unknown, is an abuse of language. How much more satisfactory to the mind is the spiritual system! Not degrading in its tendency, not arrogant in its doctrines, not attempting to explain what is inexplicable; but exalting, and expanding, and raising the mind from earth to heaven, giving us fellowship with spi-

ritual beings, and extending the interests of this globe — of this life to the universe, and to eternity. It seems only necessary to compare the manner in which the two opposite systems, the material, and the spiritual or ideal one, or even the common system combined of the two, have been received in the world, to infer that the spiritual one is congenial and acceptable to the mind, as the other is unsuitable and repulsive. Men of the highest reach of genius, of the quickest mental perception, most sound judgment and scrutinizing intellect, have opposed the purely material system ; that is, that the mind is the result of organisation, and that all is material. Mankind, in general, have had it in abhorrence ; it has never been maintained earnestly, excepting by mere tyros in science, or long excepting by a few solitary individuals, much in the manner of a paradox, and on a footing somewhat similar to that of the hypothesis that vice is profitable and beneficial to a state, and deserving, for its own sake, of encouragement. Is the soul ever warmed or kindled by the cold doctrines of materialism ? When we read or hear them announced, is there ever involuntary assent given, and approval ? This, at least, is a test of their unsuitableness to our natures. They are rejected almost instinctively by every generous mind, very much like the paradoxical notion of the beauty and utility of vice. But reverse the experiment ; try the other doctrine, inculcating the spiritual essence and immortal being of man, and affections of a responsive kind will be roused in the soul ; to use a beautiful expression of Bishop Berkeley's, " like the tremblings of one lute, upon striking the unison strings of another."

The total neglect, of late years, of metaphysical studies, or the peculiar direction which they have taken, when they have been at all followed, in our own country, has, I apprehend, more than anything else, favoured the germination of the system of materialism, and especially the appeals which have been made to common sense (vulgar sense), and the perplexed speculations which have been intemperately engaged in respecting causation. Reflecting on the apparently unprofitable nature of metaphysical pursuits, — how they have encouraged paradoxes, — how they have shaken ordinary belief, and have led from the ordinary ways of thought and judgment, and have tended to introduce scepticism and infidelity, it is not surprising that a distaste of them should have been acquired; and that active minds, throwing them aside, should have preferred physical pursuits, the results of which are certain, always interesting, and often useful. And being devoted to the contemplation of natural phenomena, neither is it surprising that they should forget, for a while, mind, or be disposed, at first, to consider mind in the same relations as they have been accustomed to consider matter — merely an assemblage of properties belonging to peculiar organisation. Thus showing that physical pursuits, exclusively followed, may lead, by an opposite road, to a conclusion as repulsive to our best feelings as the most vague and unsatisfactory metaphysical speculations; and proving that both may be abused, and that they are never more liable to abuse than when separated. Without metaphysical inquiry we must remain ignorant of our own powers of mind, and the boundaries of human knowledge; without physical investigation we must be

almost as much without the elements of thought as of power over the elements. Conjoined, they mutually assist each other, and correct each other's wayward tendencies : the one gives wings, as it were, to the faculties, and the other weight, and regulates their noblest exertion ; and they together enable the mind to attain the greatest elevation possible. At the same time, when at this exalted height, by opening the unbounded scene of the universe, and giving an impressive view of the mysteries of nature, they excite a feeling of humility in regard to self, of wonder and admiration in regard to the Eternal Mind, and thus conduce to faith in the mysteries of a system of religion whose plan is divine, and its object the salvation of man.

I shall close this chapter with a little poem, which, I believe, was written during this period of my brother's life. It displays the same habitual cast of thought as the preceding extracts in prose, and the same sentiments relative to the spiritual nature of man and his destinies : —

- “ The massy pillars of the earth,
The inert rocks, the solid stones,
Which give no power, no motion birth,
Which are to Nature lifeless bones,
- “ Change slowly ; but their dust remains,
And every atom, measured, weigh'd,
Is whirl'd by blasts along the plains,
Or in the fertile furrow laid.
- “ The drops that from the transient shower
Fall in the noonday bright and clear,
Or kindle beauty in the flower,
Or waken freshness in the air :
- “ Nothing is lost ; the ethereal fire,
Which from the farthest star descends,
Through the immensity of space
Its course by worlds attracted bends,

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CHAPTER III.

HIS SECOND JOURNEY ON THE CONTINENT. — NOTICES RESPECTING IT. — OBSERVATIONS ON THE FORMATION OF MISTS. — EXTRACTS FROM HIS JOURNAL OF AN EXCURSION INTO THE TYROL. — VERSES WRITTEN AT THE BATHS OF LUCCA. — EXPERIMENTS ON UNROLLING THE HERCULANEUM MSS. — FRAGMENT OF A DIALOGUE DESCRIPTIVE OF AN ERUPTION OF VESUVIUS. — HIS RESEARCHES AT VESUVIUS. — OPINION CONCERNING THE NATURE OF VOLCANIC ACTION. — NOTICE OF SIR JOSEPH BANKS, WHOM HE SUCCEEDS AS PRESIDENT OF THE ROYAL SOCIETY. — PARTICULARS OF HIM IN CONNECTION WITH THIS APPOINTMENT. — OBSERVATIONS ON THE OFFICE.

ON the 26th May my brother quitted England, on his second Continental journey: he passed through Austrian Flanders into Germany, descended the Danube from Ratisbon, and arrived in Vienna about the 13th June. His progress thus far, as well as a short excursion into Hungary, is briefly noticed in the following letter:—

“ Vienna, 26th June.

“ MY DEAR MOTHER,

“ We made a very prosperous journey here, and have had delightful weather.

“ In Flanders I had the satisfaction of knowing that I have saved the lives of many miners by my lamp of safety.

“ We shall remain in the Austrian States a few weeks longer, and then go to Italy. Pray desire my sisters to address a few lines to me, *poste restante*, Venice.

“ When I am at Rome and at Naples we can easily communicate by way of Naples. I prefer letters of matter of fact and business to all others ; and the harvest, and the fisheries, and the health of my friends are sufficient for a letter.

“ We receive great civilities here, both from the government and the grantees.

“ With kindest remembrances and love to my sisters and my aunts,

“ I am, my dear Mother,

“ Your very affectionate Son,

“ H. DAVY.

“ There is every prospect of a fine harvest on the Continent. In Hungary, which I have visited, they have already begun to cut their rye.”

He set out from Vienna in the first week in July, and passing through part of Hungary, proceeding southward, he made various excursions in Stiria, Carinthia, and Carniola. He was delighted with the mountain, lake, and river scenery of these Alpine regions ; and now formed an attachment to the country which lasted during life, and more than once induced him to revisit it.

“ I know no country,” he says in his “ Consolations in Travel,” “ more beautiful than that which may be called the Alpine country of Austria, including the Alps of the Southern Tyrol, those of Illyria, the Noric and the Julian Alps, and the Alps of Stiria and Salzburg. The variety of the scenery, the verdure of the meadows and trees, the depths of the valleys, the altitude of the mountains, the clearness and grandeur of the rivers and lakes, give it, I think, a decided superiority over Switzerland ; and the people are far more

agreeable. Various in their customs and manners, Illyrians, Italians, or Germans, they have all the same simplicity of character ; and are all distinguished by their love of their country, their devotion to their sovereign, the warmth and purity of their faith, their honesty, and (with very few exceptions) I may say their great civility and courtesy to strangers."

As the hot season drew towards a close, he entered Italy by the Friul, and visited Venice, having previously made a little voyage in the Adriatic to Pola in Istria.

" We entered the harbour of Pola in a felucca, when the sun was setting ; and I know no scene more splendid than the amphitheatre seen from the sea in this light. It appears not as a building in ruins, but like a newly erected work ; and the reflection of the colours of its brilliant marble and beautiful forms, seen upon the calm surface of the waters, gave to it a double effect, — that of a glorious production of art and of a magnificent picture."

This extract also is from his " Consolations in Travel."

From Northern Italy he crossed the Appenines in the beginning of October, and arrived in Rome about the 13th of that month.

I cannot find any notes preserved of this journey : in his " Consolations in Travel " many allusions are made to it, all with the same unqualified feeling of enjoyment ; and in a paper which he contributed to the Royal Society, written soon after his arrival at Rome, " On the Formation of Mists in particular Situations," he incidentally mentions the course which he pursued, in connection with his observations on the phenomena which it was his object to explain.

The "particular situations" were "over the beds of rivers and lakes in calm and clear weather after sunset," at the same time that dew is forming on the meadows or groves which line their banks.

His explanation is the following, founded on the curious facts relative to the radiation of heat from the earth into the ethereal regions, and on the peculiarity of water being of greatest density at the temperature of about 40° : —

"As soon as the sun has disappeared from any part of the globe, the surface begins to lose heat by radiation, and in greater proportions as the sky is clearer : but the land and water are cooled by this operation in a very different manner ; the impression of cooling on the land is limited to the surface, and very slowly transmitted to the interior ; whereas in water above 45° Fahrenheit, as soon as the upper stratum is cooled, whether by radiation or evaporation, it sinks in the mass of fluid, and its place is supplied by warmer water from below ; and till the temperature of the whole mass is reduced nearly to 40° Fahrenheit, the surface cannot be the coolest part. It follows, therefore, that wherever water exists in considerable masses, and has a temperature nearly equal to that of the land, and above 45° Fahrenheit at sunset, its surface during the night, in calm and clear weather, will be warmer than that of the contiguous land, and the air above the land will be necessarily colder than that above the water ; and when they both contain their due proportion of aqueous vapour, and the situation of the ground is such as to permit the cold air from the land to mix with the warmer air above the water, mist or fog will be the result, which will be so much the greater in quantity

as the land surrounding or enclosing the water is higher, the water deeper, and the temperature of the water, which will coincide with the quantity and strength of vapour in the air above it, greater.”*

After a very short stay at Rome my brother visited Naples, and began his researches on the *Herculaeum MSS.* His first results were of a very encouraging kind, confirming the expectations which he had previously formed from some trials which he had instituted in England. In a letter to his mother, written on his return to Rome, dated February 25th, 1819, he says:—

“ We have been at Naples, and I have been perfectly successful in the object of my journey.” He adds, “ I am not certain about the time of my return to England. This will depend upon the determination of our government respecting a plan which I have sent them, connected with my success at Naples, and which will probably bring me to England in the summer.”

Contrary to the expectations thus expressed, he remained on the Continent. He spent the early part of the summer in a tour to his favourite regions in the southern states of Austria. Of this tour, which was a rapid one, and chiefly undertaken for the sake of fishing and shooting, he has left a pretty copious journal, the greater part of which I shall insert.

He set out on it from the baths of Lucca on the 22nd of June, in a caratella, and two post horses, with his servant and his two dogs. By posting he rapidly crossed the Appenines and the plain of Lombardy. He quitted Italy by way of Verona:

* *Philosophical Transactions*, 1819.

On the 26th he was at Roveredo, at the entrance of the Tyrol.

“ 27th. — Went off this morning at six to the top of the Lago di Garda, two posts ; the temperature at Roveredo was 74° to 75° . After we had crossed the Adige, it fell to 73° ; and there was a strong breeze from the lake. Passed by the villa of Count Castrobarcha, with a pretty lake surrounded by mountains, and sending a small tributary stream to the Adige. When we got upon the hill above this lake, the Lago di Garda broke in upon us with great magnificence, of a bright sapphire tint ; and this tint, contrasted with the red and dun colour of the limestone cliffs of the mountains above it, on which white clouds were moving, gave great beauty and grandeur to the scene. The river, which was one of my objects, was turbid from the melting of the snow ; but I saw a number of the trouts taken in it from forty to three pounds. They are evidently a trout having habits which lead them to feed in the lake, and then mount against the stream to spawn. They are all fat and silvery in their colour, and I think the best fish I ever tasted. The common trout, which is brought down from another river near Rivo, and which is exactly our river trout, ill fed, they call *carpione*. The trout of the Lago, and of the river which runs by Tubione, are like those of the Colne, and have hardly any spots.

“ The general geological aspect of the country in the neighbourhood of the Lago di Garda, is like that of Illyria ; the same great masses of limestone, and a similar stratification. The picturesque aspect is not unlike ; but here the olive and the vine clothe the sides of the hills, and the chestnut and the oak rise to the

tops of the mountains ; and in Illyria, the beech and the oak occupy the hills, and the pine is the tree of the mountain. Rivo, I think, would be a more agreeable place for summer than the baths of Lucca ; for there are trout, coturni, pernice, galline, and the great *coc de Bois*. Is this a fable of the host ? Yet, Dal Armi told me they were found near Trent.

“ 28th. — Passed rapidly through Trent ; saw Dal Armi, who told me that the pitzardone was found in the Tyrol, probably in the marshes above Trent, in the end of July and the beginning of August. Clouds began to gather upon the mountains, and rain effectually cooled the air, and prevented my newly repaired wheels from taking fire. Got to Bolsano, and slept at the Kaiser Krone, a tolerable inn. A thunder storm kept me within doors. This is called an Italian city, but its population is German ; not one person out of ten speaks Italian.

“ 29th. — Left Bolsano at seven ; a beautiful morning. Saw the clouds which remained, the remnants of the storm, rising up the snowy crags and cliffs, and pine-covered sides of the stern mountains. Passed several torrents with some little difficulty : found the scenery near Brixen inferior to that close by Bolsano ; but on leaving Brixen and taking the Carinthian road, it became very grand. This branch of the Eisach foams over rocks amongst green meadows and vineyards ; and a few chestnuts, and walnuts appear in the green fields, and the dark pine is above. Slept at a genuine Tyrolese inn ; civility, cleanliness, and all the comforts of the best English country inn ; all the attendance by women. The postmaster, the innkeeper, and, how I know not in a country so little travelled through, every thing seemed to be

in order. I suspect the country people make great use of these inns, for I saw numerous parties eating and drinking.

“ 30th. — Slept at Silliane, after a very pleasant day’s journey ; ascended through meadows to the spot where the waters part, and saw to the east the source of the Drave, a beautiful limpid stream ; and to the west that of the Eisach. Above the Brunneken, the mountains are very grand and bold, and immense masses of snow covering them to their apparent bases, so that they looked like the snowy Alps in winter. The temperature of the air from 48° to 60° ; that of the Eisach, where it is a small stream, 52° . Below the Brunneken a magnificent chain of mountains is seen to the south or the Italian side, and accompanied my view all the way to Silliane, which is on the banks of the Drave, a stream here containing no hucho, but trout and grayling. These mountains appear of granite, and excessively bold and precipitous ; very like the needles in the valley of Chamonni, and bearing almost the same relations to snow, which lay in immense masses, even at their juncture with the pine-covered hills.

“ July 1st. — A very fine day. In the morning the thermometer at half-past six at 55° ; it rose towards two o’clock as high as 65° . Fished in the Drave and the stream that joins it below Silliane, and caught fourteen or sixteen trout and grayling. Observed that the fish lay more in the still pools near the great river, and in the divisions of the river in water meadows, where they are not so liable to be carried off by the rapid torrent. The hucho does not rise so high as this ; the grayling were larger than the trout ; one near a pound. My host’s son, who spoke Italian, and a little French, did the honours of the house with

infinite civility; and the people in general seem an excellent race, not interested, courteous in manner, and independent in character.

“2nd.—It rained in the beginning of the night: thermometer at my window this morning at seven at 56° , and it rose to 60° in the sun. Left Silliane. My bill amounted for the two days to ten florins*; and including a bottle of Wurtzburg wine, two florins. The valley of the Drave became warmer as we approached Lientz; the river was turbid from the rain of last night; and in summer, I was informed, is rarely clear. Either the heat melts the snow, which occasions a flood, or the clouds bring rain. The town of Lientz is near the confluence of the Drave with the Isel; and the Isel is much the larger river of the two. It was more transparent than the Drave, but had that blue milkiness which I have always found indicating a snowy origin. The little plain of Lientz, surrounded by hills and mountains, is extremely rich, and its temperature so much higher than that of the valley above, that Indian corn ripens; and some rye was already cut. The day was cloudy and showery, yet the thermometer stood at 64° . The temperature of the Isel, 54° . The prospect of bad weather induced me to give up the idea of going to Heligoblate and to the Glocknee; and I was informed that this was not the season for the hucho, that they are found or caught only in spring and autumn. I saw none; and went to Overdranberg, where I saw some large grayling in a little stream of beautiful clearness tributary to the Drave. The inn did not tempt me, nor the offer of showing me some hares to shoot, made by the innkeeper; and I went through the same kind of scenery to Griefen-

* The florin is equal to 2s. 4d. of our money.

berg, where I found a good inn, and had a hucho of about two pounds and a half for dinner. It is like an ill-fed trout, but has no spots; is much longer, and perfectly silvery; its skin remarkably thick; its taste hardly different from that of the trout; it did not calver much, but probably it was twenty-four hours old. The hucho that I eat at Gratz last year calvered like salmon. I walked by the side of a beautiful stream that rose up through a glen covered with pines, and fell over rocks, making some fine cascades. The valley here is well cultivated, extremely green, and the haymaking going on. I tried in vain for hucho; but seeing a landrail, and hearing some quails, I brought down the dogs; found the landrail, and shot it, and shot two quails; but gave up the sport, for they were too young.

“ 4th. — Came on to Saxenberg, where I took a twelve o'clock dinner,—soup, salad, and veal cutlets, and Illyrian wine; expense, 1 florin 14 kreuzers* for myself and servant. Looked at the Muhl; a clear stream, with a little snowy milkiness, as large as the Ischil. Saw no huchos. The scenery of the valley of the Mol or Muhl is very fine, and bounded by snowy mountains. Came on to Spital, and walked to the Mulhstadler see, from which a beautiful clear stream joins the snow-tinted Lider, and makes its blueness more transparent. The Mulhstadler see beautifully clear, and commanding fine views of the snowy mountains of the valley of the Lider. The scenery about Spital contains much of beauty and of grandeur. Caught in a half hour, in the Mulhstadler river, ten trout, some $\frac{3}{4}$ lbs.; they did not cut red. Saw a number of small perch in this river. German women.

* The kreuzer is equal to about $\frac{1}{10}$ of our penny.

Tyrolese Catholics. Lost my passport. Temperature this day from 75° to 80° .

“ 5th.—Came on to Villach, where I slept. Temperature in travelling from 80° to 86° ; in the inn at Villach, a large room, about 73° or 74° . In coming down upon Villach, left the micaceous schist chain of mountains, and had a fine view of the calcareous chain of the Loikel, with Mount Craie rising above the rest, snow still remaining in the hollows of its conical summit; and to the west of it, the highest of this boundary chain on the road to Tarvis rose in great majesty, its limestone peaks covered with snow.—Drove to the Osiacher see, about three miles; a piece of water of no great beauty, except when it was brought in front of the great mountain chain; a slow stream issued from it full of coarse fish, but I saw no trout. Barbel, roach or dace, in abundance. I did not observe the goitre much in the valley of the Upper Drave; but here, and on entering the valley of the Muhl, it becomes so common that every second woman has it, at least those past twenty-eight. The Carinthian women have fine arms, which they expose, and fair hair. I once thought a part of the Italian character, their indifference to human life, depended upon their constant familiarity with statues, images, and pictures in which death and wounds are represented; but in the Tyrol, wooden images of Christ and the two thieves, as large as life, and with blood and wounds in abundance, are constantly seen on the roads; and yet this people is freest of all from the crime of assassination. I think the exposure of the human body and face, as we see in Italy, at funerals, has a bad effect on the mind.—Temperature of a warm bath near Villach 84° .

“ 6th. — Set out for Wurtzen at half past six. The

thermometer was already at 75° , and it rose to 80° and 82° on the road. Crossed the mountain-stream which divides Carinthia from Carniola, and saw the mountain which furnishes the molybdate of lead,—an immense mass of yellow and red limestone. The view in coming into the valley of the Save very fine. Immense mountains of limestone, precipitous and rugged; pines reaching about two thirds up, and immense masses of snow in the hollows. In coming within the influence of the snow the thermometer fell to 78° . Found the inn tolerable, and the Save a fine trout stream; so I staid to fish, and to examine the source of this beautiful water: caught eight trout, one of them at least a pound. Found the temperature at the bridge 60° . It rises about a quarter of a mile above Wurtzen, and must have a temperature about 50° or 52° ; for I had no thermometer. It gushes forth from a number of small holes, and where it first rises may be leaped across; but it soon enlarges, and forms a beautiful clear lake surrounded by rushes, and in which there are wooden houses for shooting wild ducks at the time of their passage. The mountains round this place are very grand on all sides. The road to Tarvis, and so on to Porteba and Udino, only a post and a half off; so that it is easy to go from this place to Udino in a day. The meadows very green,—the hay making; heard no quails, but some landrails, and my dog found one. The wild ducks do not breed here, nor snipes; but they migrate here in the beginning of August. The common language is Sclavonic. The whole chain of the Carniola mountains on the side of Carinthia is distinguished by its beeches; it rises to 3000 feet, or 4000 feet. Temperature, until two o'clock, 80° . After, it became cloudy and the thermometer fell

to 76°, to 74°, and at last to 70°; and in-doors, at ten, it was 68°.

“ 7th. — Temperature of the air on the road from 78° to 91°; generally 91° in the little close villages, and from 84° to 86° on the road. The road from Wurtzen to Ratmansdorf very beautiful; fine views of the two chains of mountains, those of Carinthia, the Loibel, and those of Carniola, having Mount Terglon for its highest point. That branch of the Sava which I followed down is called the Krainer Sava; the other, which has its origin in the Wolkshumersee, is called the Wolkein Sava. Went out of the post road at Asling or Sava to go to Ratmansdorff. This is one of the most beautiful drives I have seen. The plain between the two chains of mountains is elevated on the side where it meets the Carinthian mountains above the valley of the Save, and is rich in pasture, with clumps or hedgerows of trees,—walnuts, ash, elms, chestnuts, limes, and beeches. It is like an English nobleman’s park, with an intermixture of corn, clover, and maize. There is a fine cliff to the right topped by a picturesque castle, and one range of broken hills, and four distinct ranges of mountains; the last the bare and snowy Terglon. Through the valley the Sava winds; and the meeting of the two waters, the one bright blue, the other sea-green, is distinctly seen. The lowest hills have the same vegetation as the plain; the next range, oak and beech; the third, pines; the fourth, pines and bare rock; the fifth, without any appearance of vegetation, cliffs of marble or masses of snow. By the sides, or upon the bases of the hills, are seen beautiful villages, with white spires rising amidst the trees. Man seems here capable of

enjoying life; animated nature is gay, and inanimate nature beautiful and sublime. I was received at the house of a shopkeeper who entertains strangers as an innkeeper. I found the beds good, the Carniola wine excellent, and the *cuisine* not bad, and abundant. Two persons only in the village spoke Italian, and a few German. My guides were Slavonians; and, except that I could not understand them, very good guides. I fished this evening in the Sava; it was exceedingly hot. Thermometer above 80° till nine o'clock. I took nine small trout and grayling; the grayling I found excellent. Thermometer at twelve, in my room, 72°; at six in the morning, 70°.

"8th. — Went in a caratella to see Maria see, a lake about six miles off: the country of the same kind, and views similar to those of yesterday; both chains of mountains seen from the lake, which is clear and beautiful, surrounded by cultivation. On a small island, with a white church, and houses surrounded by trees, the cliff and castle, which I saw yesterday in the distance, rise out of the lake as at

. I have seen no small lake more beautiful; it abounds in fish, the best of which are the waller (*silurus glanis*), and carp. I bought a waller of two pounds for a twenty kreuzer piece. It is a fish very like a barbot, but grows to an immense size; had no back fin, but a small antenna instead, and has an immense mouth. Temperature was from 80° to 90° on the road, and is now in the shade at my open window 87°. Returned by the Wolkhein Sava. The views up the valley are very beautiful. By shutting the window I have reduced the temperature to 76°. I saw yesterday the May-fly, green and grey; but the fish did not seem to take them. I have seen no

fire-flies since I left Bologna ; none on the Veronese road, which I travelled late. Is the season over, or does the neighbourhood of the Alps interfere ? Yet I saw them at Domo D'Ossola, even in the end of June (about the 24th or 25th).

“ The waller I have just eaten (two o'clock), for I have adopted the habits of the country (twelve is the dinner hour), and I do not think it pre-eminent ; very like a whiting ; softer than a barbot, but good and clean tasted. The wine of Carniola is excellent, both here and at Adelsburg and Planina ; it is probably the same, for they call it “ melsh,” which I presume means *foreign*. I got some “ *iron forte*,” cast iron, from Sava, to ascertain if it be not an alloy of silicum. All the mountains here calcareous. Left Ratmansdorff at two o'clock. The afternoon was intensely hot, thermometer from 88° to 93°. The views of the Sava of the same kind as those about Ratmansdorff. About two miles before I reached Kranburg, the highest of the Carinthian chain of mountains came in view ; its sides still spotted with snow, and evidently limestone. It is on the right of the pass of Loibel going into Carinthia. I saw fire-flies in great abundance ; they appeared less luminous than those of Italy. I now am almost certain I saw one in the valley of the Drave ; I think about Villach. Came to a new inn at Laybach, Dettla's. At Kranburg I came upon the Sava at its confluence with the Zura. These two rivers, when I could not reach them, fixed my imagination, and awakened the brightest visions of the angler ; within my power I lost the appetite ; and I was already tired of fishing for small fishes in a burning sun, and I saw no hucho. But human life has its best part in pursuit, — happy when its ob-

jects are useful or innocent. Got to Adelsburg at nine o'clock; the Chernitz see was full of water, so that I could not see the bocca. Between Laybach and Loitch the heat was intense; the thermometer rose to 97° , and was never below 92° . A friendly thunder storm came on whilst I was at Loitch, and the wind blew from the Alps; so that after three o'clock it was tolerably cool.

"10th.—The same cool breeze continued. Came to Wippach, where I found a fine trout and grayling stream, and stopped. I caught two grayling and seven trout this evening. The trout averaged half a pound a piece, and one of the grayling must have been nearly two pounds. This stream rises from the limestone rock, and, as I was informed (for my thermometer is broken), is 60° or 70° in temperature. The country here is pretty, and a very neat clean inn.

"11th. — It was very hot; but a breeze of wind at nine o'clock induced me to try fly fishing. I hooked four large trout and landed two; one must have been above two pounds, and cut very red. The May-fly was on the water; and yesterday evening, the duncat, the alder-fly, with May-flies, and all the insects known in June and the beginning of July in England. This is the best fishing stream I have seen on the Continent. There are stags and roes in the woods above, and *caturni* close to the town; but they are very difficult to kill. I saw near Planina the river which is supposed to empty the Urking see. It issues, like many of the rivers of this country, from a bed of limestone. The duncat was on the water this evening, and an infinite variety of flies. I began fishing at five o'clock, and soon caught four very fine

trout above a pound a-piece, and one above two pounds. I caught these with very large flies, the peacock-body and redwing; I changed my fly to the red hackle with orange body, and caught a grayling and a trout of three quarters of a pound, and one of half a pound, and one of one pound. I then changed for the peacock harle, red hackle, and white wing; and caught six noble graylings, all but one above a pound, and one above two pounds. Altogether sixteen fish this day, and I hooked a great many more; by far the best day's fishing I ever had in July. I saw a trout of at least six or seven pounds, but he was in stagnant water. Heard this day, for the first time, of a comet. The wine is excellent.

"12th. — Came on to Gortzen, and received all possible hospitality from the Comte de Thunn. It was still hot, but a thunder storm in the evening reduced the temperature considerably. The views upon the Sonzo are extremely beautiful; wild mountains, with rich plain and valley scenery, and the cultivation of Tuscany. The corn was cut, and the ground ploughed up for a new crop, and the Indian corn higher than my head.

"13th. — Went this day to the Count's villa, and spent the day there; looked for game in vain in the morning, but had some magnificent views of the country from the heath and chestnut-clothed hills above the villa: went out to fish after dinner, and caught a trout immediately; but a thunder storm came on, with hailstones as big as nutmegs, and put an end to my sport, or I should probably have caught very large trout in this magnificent river. I saw one rise of at least four pounds, last night; but such a storm I never saw before: the lightning was incessant, and

it rained, hailed, then thundered, for at least three hours."

On the 14th he left Gortzen, and, descending from the mountains, hastened back to the baths of Lucca, by Padua, Ferrara, Bologna, and Florence, where he arrived at one o'clock in the morning of the 18th or 19th, and where his journal terminates.

The remainder of the summer and the beginning of the autumn he passed at the baths of Lucca, which, from their mountainous situation, afford a pleasant, cool, and wholesome retreat from the heats and malaria of the plains and valleys of Italy.

The principal memorials of his sojourn at this beautiful spot which occur in his note-books are of a poetical nature, very similar to those outbreaks of feeling, sentiment, and reflection, which have been already given, relating to his first journey, and not less forcibly expressing his love and admiration of nature, the fervour of his conceptions, his sympathy with what is most affecting in the beauties of nature, and his lofty aspirations and imaginings. I do not think it right to keep back these remains; and they may be more interesting and acceptable, from having been composed without any view of publication, and from being, as most of them are, in an unfinished state: —

“ TO THE FIRE-FLIES.

“ Baths of Lucca, 1819.

“ Ye moving stars that flit along the glade !
Ye animated lamps that, 'midst the shade
Of ancient chesnuts, and the lofty hills
Of Lusignano, by the foaming rills
That clothe the Serchio in the evening play !
So bright your light, that in the unbroken ray
Of the meridian moon it lovely shines.
How gaily do ye pass beneath the vines

Which clothe the nearest slopes ! how thro' the groves
 Of Lucca do ye dance ! The breeze that moves
 Their silver leaves, a mountain zephyr's wing,
 Has brought you here to cheer our tardy spring.
 Oft had I seen ye 'midst thy orange bowers,
 Parthenope ! and where Velino pours
 In thundering cataracts ; but ne'er before
 So high upon the mountains, where ye soar
 E'en in mid air, leaving those halcyon plains
 Where spring or summer everlasting reigns,
 Where flowers and fruit mature together grow,
 To visit our rude peaks, where still the snow
 Glitters e'en in the genial month of flowers.
 But brightly do ye move in fiery showers,
 Seen like the falling meteor from afar,
 Or like the kindred of the erring star.
 May not the stars themselves, in orbits whirl'd,
 Be but a different animated world,
 In which a high and lofty breath of life
 Of worlds and insects calms the wakening strife,
 Commands the elements, and bids them move
 In animation to the voice of Love !"

" Thou loveliest form of the celestial world,
 When in the circle of thy brightness
 Thou sheddest in the blue unclouded sky
 All thy meridian lustre ! in the north,
 Above the heath-clad mountains have I seen
 Thy clear and mellow light ; and when the waves
 Of the Atlantic raised their foaming surge
 Against the eternal rocks, where fabled sleeps
 The last of western Titans,— then, when young
 In mind, and light of heart, thy rays had power
 To solemnize and tune to thoughts sublime
 My vagrant spirit ; now, in these fair climes,
 Where in a purer and more balmy air,
 And in a sky whose tints of ether seem
 Giving a saint like glory to thy rays,
 Thy influence is e'en stronger in a heart
 Wearied, but not yet broken or subdued.
 Though many checquer'd years have pass'd away
 Since first the sense of beauty thrill'd my nerves,
 Yet still my heart is sensible to thee,
 As when it first received the flood of life
 In youth's full spring-tide ; and to me it seems
 As if thou wert a sister to my soul,
 An animated being, carrying on
 An intercourse of sweet and lofty thoughts,

Wakening the slumbering powers of inspiration
In their most secret founts of feeling high."

" The tempest gather'd on thy verdant hills,
O Lusignano ! The azure southern sky
Was dimm'd by fleeting mists. Soon the dark cloud
Form'd more compact, and to the zenith rose ;
The bright blue of the northern distance then,
And all the mountains show'd their shaggy crests
Of ancient chestnuts, dark and deep in shade.
To the feverish flush of the meridian sun
Succeeded quick a damp and sudden chill ;
The lightning flash'd. At first, a feeble light,
Scarce seen, even in the darkest part of heaven,
Succeeded by low murmurings ; brighter gleam'd
Each flash that follow'd, and now louder roar'd
The thunder distant, but it soon became
The loudest burst of heaven's artillery."

" The whirlwind gone,
A calm, a soothing freshness soon succeed.
Thus in the mind springs new-born energy.
Thoughts that were dead are roused,
And all the purer being wakes again.
The slime of foulness and impurity
Are borne into the ocean deep of reason,
And new creations dance upon its waves,
E'en as they purify—a thousand forms
Of beauty, and of goodness, and of grace.
The intellectual soul, freshen'd by dew
From heaven, enrich'd, is glad and green with life."

" Again that lovely lamp from half its orb
Sends forth a mellow lustre, that pervades
The eastern sky, and meets the rosy light
Of the last sunbeams dying in the west.
The mountains all above are clear and bright,
Their giant forms distinctly visible,
Crested with shaggy chestnuts, or erect,
Bearing the helmed pine, or raising high
Their marble columns crown'd with grassy slopes.
From rock to rock the foaming Lima pours
Full from the thunder storm, rapid, and strong,
And turbid. Hush'd is the air in silence ;
The smoke moves upwards, and its curling waves
Stand like a tree above. E'en in my heart,
By sickness weaken'd and by sorrow chill'd,
The balm of calmness seems to penetrate,—

Mild, soothing, genial in its influence.
Again I feel a freshness, and a power,
As in my youthful days, and hopes and thoughts
Heroical and high ! The wasted frame
Soon in corporeal strength recruits itself,
And wounds the deepest heal ; so in the mind,
The dearth of objects and the loss of hope
Are in the end succeeded by some births
Of new creative faculties and powers,
Brought forth with pain, but, like a vigorous child,
Repaying by its beauty for the pang."

In regard to the pursuit of science, this summer appears to have been passed almost in inactivity. The only inquiry that I can find he engaged in was the examination of an ochreous substance, which is pretty abundantly deposited from the water of the hot baths of Lucca. He communicated on the subject a short paper to the Royal Academy of Sciences of Naples, which was republished in the 19th vol. of the "*Annales de Chimie et de Physique*." He found that this substance consists of peroxide of iron and silica ; he supposes that it exists in solution at a high temperature in the interior of the earth, the iron in the state of protoxide combined with the silica, which acts the part of an acid ; that they assume the solid form, and are deposited together in consequence of reduction of temperature, as the water cools in approaching the surface, and the conversion of the protoxide into the peroxide by the absorption of oxygen ; and he offers the conjecture that ochres generally have probably a similar origin.

On the approach of winter he returned to Rome, from whence he again visited Naples, where he arrived on the 1st of December, with the intention of remaining two or three months, for the purpose of completing the object of his journey.

Both the results of his inquiries relative to the Herculaneum MSS. and the nature of volcanic action, the two principal objects he had in view, he communicated to the Royal Society in 1821 and 1827, under the title of "Some Observations and Experiments on the Papyri found in the Ruins of Herculaneum," and "On the Phenomena of Volcanos." A brief notice of each of these papers will suffice.

Contrary to the common opinion, he ascertained, and proved in a satisfactory manner, that the MSS. at Herculaneum had not suffered from fire, but from the slow and intimate action of their elements, by which a change had been produced in them, in the course of time, similar to that which has taken place in the conversion of wood and vegetable matter into Bovey coal and peat. The processes to which he had recourse to aid in unfolding them were of a chemical kind, chiefly founded on this change. They consisted principally in the application of agents, as chlorine and ether, which have either the effect of decomposing or dissolving the bituminous matter formed, by which the leaves of the MSS. adhere, and the employing of a graduated temperature.

These methods answered fully his expectations. Whilst they had no injurious effect on the written character (the basis of the ink of the ancients being charcoal), they promoted the separation of the leaves, and greatly facilitated the manual operation. But unfortunately they were of little avail, partly on account of the ill-timed and unworthy jealousy of the curators of the Museum, and partly owing to the very injured state of the MSS. themselves, either previous to their excavation, or subsequent, induced by careless keeping, exposed to the action of the air, or in consequence of the attempts of others to ascertain

their contents or to unfold them. From these unforeseen circumstances the investigation has proved more interesting to chemistry than to literature ; as displaying the effects of time, the changes and combinations which may result from the elements of vegetable matter acting on each other, and as tending to illustrate some important phenomena in the economy of our globe, and how effects very analogous (I allude to those of carbonisation) may be produced by causes totally different and opposite.

Previous to mentioning the results of his observations on the phenomena of volcanos, I shall insert a description of a volcano in activity, which occurs in one of his unfinished dialogues. The speakers are supposed to be on the summit of Vesuvius, waiting the rising sun : —

“ *Arch.*—It is now almost the time when we should perceive the dawning of the eastern light ; but from those heavy clouds which obscure the whole of our horizon, and from the long-continued and dead stillness of the mountain, I suspect that we are on the eve of some great change, and a storm, if not an eruption, is approaching ; so I think it will be prudent for us to return to Naples. (The party return to Naples.)

“ *P.*—It would have been too much to have expected in twenty-four hours, and after so splendid a sunset as we witnessed last evening, the re-appearance of that glorious luminary, under the same brilliant and beautiful circumstances. But the storm which you augured does not yet fall. There is a peculiar heat in the air ; and the sea, though there is no breath of wind, seems to roll waves almost as

black as pitch, from the reflection of the sky towards the shore.

“*A.*—Surely I felt at that moment a motion of the ground beneath me. And, hark! the bells of the churches tinkle; it must have been the first shock of an earthquake!—

“*All.*—We felt it.

“*A.*—Watch the mountain! See the pitchy cloud on the top of it bursts open, and a column of flame, and a jet of lava, and red-hot stones rise into the middle heaven! The ground again shakes! and, lo! the tremendous thunder of an eruption!

“*P.*—Lo! the lava bursts from the top! And watch the skies filled with flame: a river of fire descends to the earth! I give you joy, Archæus, that the wish you have so long indulged is gratified, and that you will have an opportunity of examining and studying the results of a volcanic eruption. But the lightning now flashes from the thick clouds into the flame of the volcano, and the thunders of the heavens respond, as it were, to the noise of the subterraneous artillery; the rain falls in torrents, and a thick cloud, which, from its extreme darkness and opacity, must contain stones or dust, is approaching towards Naples! We must wait for another day to make our visit to the mountain; it would now be a service of danger to attempt to approach it.

“(*Change of Scene — The Base of Vesuvius.*)

“*A.*—The violence of the explosion is now over. Though the clouds still cover the top of the mountain, yet I think we can ascend to the spot whence the lava issues as from a fountain. And what a magnificent sight is this river of fire, nearly half a mile in length, and in some places fifty yards broad!

“*P.*—It would be still more magnificent in the night, when its high temperature would be more apparent, and when the dense white smoke rising from it would appear like flame from the reflected light. The appearance of the lava does not correspond to what I had expected to see. It appears liquid only at its exit from the mountain; and, though continually moving on, it soon loses its character of a river of fire, and appears only a shapeless heap of enormous slags, covered with ashes, and destroying every thing it meets in its course.

“*A.*—The fused lava soon cools, from the effects of the atmosphere at the surface, and forms those large masses of scoria; the liquid still moves on below, being pressed forward by the new portions thrown from the fountain. But in a dark night all these masses would appear more or less luminous.”

This description is not imaginary; it is, I believe, a faithful account of one or two scenes which he witnessed in the winter of 1819 and 1820, when the mountain was even more active than in 1814 and 1815, and more favourable for the inquiries he was anxious to institute, relative to the powers on which volcanic action depends. These inquiries were directed to the hypothesis already detailed, which he advanced after the discoveries he made in 1807 and 1808, that the fixed alkalis and earths are inflammable bases united to oxygen, and in their uncombined state possessed of such a powerful affinity for oxygen as to be capable of decomposing water. Many facts, previously well known, in connection with active volcanoes, were not unfavourable to this hypothesis; some negative sufficiently confuting all former hypotheses;

others positive, as the nature of the matters ejected, the lava and cinders composed of the oxidated bases of the earths and alkalies; and, as the almost general fact, that water is concerned in volcanic eruptions.

Now, were this hypothesis correct, it was probable that conclusive proofs might be collected in carefully examining the phenomena of an eruption and its products; it might be expected that inflammable air might be detected issuing from the volcano, or rising in flame, or that some pure or uncombined alkaline or earthy inflammable bases might be discovered entangled in the lava.* The results of his inquiries directed to these points were negative. In none of several instances in which he experimented on lava, when freshly poured out, and in a liquid ignited state, could he detect any traces of inflammable matter. He expresses the results very briefly in his "Consolations in Travel." Referring to the hypothesis in question, he observes, "I made many, and some dangerous experiments, in the hope of confirming this notion, but in vain."

In the paper now under consideration, even after a detail of his experiments, he continued rather favourably disposed to this hypothesis: wanting the decisive proofs, he supposes that the inflammable bases may act,—that the chemical changes may take place

* I may add, that the absence of iron in its metallic state, amongst the products of volcanos, so abundant oxidated in the first degree of oxidation, is very unfavourable to the idea that large quantities of inflammable gas are evolved in volcanic eruptions, or even disengaged. Were this oxide acted on by hydrogen at a high temperature, what is there which could prevent its decomposition? and if reduced, we might expect to discover it in this state, at least occasionally, enveloped in and protected by lava.

in immense excavations in the earth, of the existence of which, under any active volcano of long standing, little doubt can be entertained; and that the bases there undergo complete combustion previous to eruption, and the inflammable gas is either entirely or in great part consumed.

He at the same time allows that a simpler explanation of volcanic fires may be given,—that of referring them to the supposition of the nucleus of our globe being in a liquid ignited state, and liable to break out through the crust of solid matter which envelopes it. To this simpler hypothesis he gave the preference in his last work. In support of it he observes, “There are distinct facts in favour of the idea, that the interior of the globe has a higher temperature than the surface. The heat increasing in mines the deeper we penetrate, and the number of warm sources which rise from great depths in almost all countries, are certainly favourable to the idea. The opinion that volcanos are owing to this general and simple cause, is, I think, likewise more agreeable to the analogies of things, than to suppose them dependent upon partial chemical changes; such as the action of air and water upon the combustible bases of the earths and alkalies; though it is extremely probable that these substances may exist beneath the surface, and may occasion some results of volcanic fire.”

This opinion, now, is the one which is best supported by facts, and which is most generally received; but whether true or false we may never have it in our power to determine. Negative evidence can never be satisfactory, and at present this hypothesis chiefly rests on negative evidence; and I say so advisedly,

taking into consideration the additional knowledge that has been obtained by observations on the new volcano which broke out in the summer of 1831 in the Mediterranean.

The subject of volcanic fire is altogether mysterious; and it will probably remain a mysterious problem till we are better acquainted with the nature of heat and of the other imponderable or etherial agencies,—whether they exist as distinct powers or substances, or are merely modifications of some one subtle element or influence. How the light of certain animals, as of the fire-fly and glow-worm, and the innumerable tribes of animalcules which inhabit the ocean, is produced; how animal electricity, as that of the torpedo, gymnotus, and silurus, is generated; how the sun and fixed stars are for ever emitting heat and light;—these are problems, all equally unsolved. But being more in the ordinary course of nature, they do not excite ordinary curiosity and a desire to explain them, in the same degree as the fire of the volcano and the shock of the earthquake, which are witnessed rarely and occur unexpectedly. Were the latter daily occurrences in every country, they would excite as little attention as the heat of our fires and the light of our lamps; had every region its volcanic mountain, we should, like the inhabitants of Stromboli at present, as I learned when I visited that remarkable islet, be alarmed only when the mountain is still.

It could hardly be supposed that my brother's motives for modifying his views respecting the nature of volcanic action, as above stated, and for giving up in part a brilliant hypothesis, could be misinterpreted and referred to an unworthy feeling; yet this, to my surprise, has been done, and even by Dr. Charles

Daubeny, Professor of Chemistry in the University of Oxford. This gentleman, in defending the hypothesis which he advocates, and which is precisely my brother's early hypothesis, comparing Sir H. Davy's early views with his later, says, "The authority of Sir H. Davy may, I conceive, on this occasion be fairly pleaded against himself, and the weight of his *ipse dixit* in the two latter years of his life be viewed as counterbalanced by the contrary judgment he had pronounced, apparently on the same evidence, at an earlier period; neither is it inconsistent with what we know of his character to suppose, that he should have acquired a distaste for the theory in question when he found it seized upon and illustrated by an humble class of inquirers."* This, I would remark, is neither generous nor just, nor even reasonable criticism. It is not generous to assign to unworthy motives a meritorious act; for so, surely, may be viewed the relinquishing such an hypothesis by the author of it, when he found it not sufficiently supported by facts. It is not just, because not true, that he merely gave his *ipse dixit* against his early hypothesis: in my brother's observations on volcanos, as I have mentioned, he assigned his reasons for so doing, consisting chiefly in want of the positive evidence which he expected to have met with in examining into the phenomena of active volcanos, provided the chemical theory were true. And, least of all, is the criticism reasonable: it is almost absurd to suppose that my brother would relinquish his hypothesis because approved of and advocated by others.

* "Remarks on Thermal Springs and their Connection with Volcanos," in Edinburgh New Philosophical Journal, No. 23.

Dr. Daubeny might as well have fancied that he would have changed his views respecting chlorine or the metallic basis of the fixed alkalies, as soon as they were "seized upon and illustrated by an humble class of inquirers."

My brother quitted Naples early in spring. In a letter to my mother from Rome, of the 13th March, he says, "John is, I trust, now on his passage homewards from Ceylon. We are so far on our return, and I hope in the autumn we shall meet from different quarters of the world at Penzance. I have finished with success, and much sooner than I expected, the objects for which I came abroad. Lady Davy is not very well, and we are obliged to travel slowly; but I hope we shall be in London in the end of May or beginning of June. We shall return by the south of France; and if Grace should be so good as to write to me, she can address to me, *poste restante*, Bourdeaux."

On my arrival in England, on the 20th June, I had the satisfaction of meeting him; he had returned a few days before.

On the 19th June Sir Joseph Banks, who had been so many years President of the Royal Society, died. "He was a good-humoured and liberal man, free and various in conversational power, a tolerable botanist, and generally acquainted with natural history. He had not much reading, and no profound information. He was always ready to promote the objects of men of science; but he required to be regarded as a patron, and readily swallowed gross flattery. When he gave anecdotes of his voyages he was very entertaining and unaffected. A courtier in character, he was a warm friend to a good King. In his relations to

the Royal Society he was too personal, and made his house a circle too like a court." *

My brother immediately came forward as a candidate for the office thus rendered vacant ; the highest of honour to which a man of science can aspire in England. The dignity, no doubt, was attractive to him. It was surely an honourable ambition to occupy a place which had been filled by Newton. But this, I believe, was not his principal motive. He conceived that his powers of usefulness would be increased ; that he should be able to give an impulse to science, and forward its advancement by example and exhortation ; and he flattered himself that he might be able to prevail with the members of his Majesty's Government to afford to science some substantial support, worthy of the cause and worthy of the country, which to the resources of science had hitherto contributed so little and had owed so much.

Other candidates were spoken of at the same time, and for two of them their friends canvassed to some extent. The competition, however, was of short duration. On the 30th of November, the day of election of the officers of the Society, there was a very full attendance of the Fellows, on the rare occasion of voting with open lists ; the result of the ballot was almost unanimous in favour of my brother, and he was accordingly pronounced duly elected by Dr. Wollaston, who was then acting President ; and for seven years afterwards he was successively re-elected without the least opposition.

I was with him the whole of the day of his first election, and can record with pleasure how tranquilly he passed it : in the morning he had no apprehension

* MS. Notices of Distinguished Characters.

of failing of success, and in the afternoon he showed no undue exultation in having obtained it. Before going to the public dinner of the Society, held on the anniversary of the election of its officers, he prepared an address, and the speeches it would be required of him to make, as was always his custom when he had to speak in public; for he held that preparation was necessary to speak well. The dinner was very crowdedly attended; and the manner in which his speeches were received, for so grave a body, was quite enthusiastic. On the first regular meeting of the Society after St. Andrew's Day, on his taking the chair, he delivered an address, "On the Progress and Objects of Science," in which was well displayed his peculiar style of poetical illustration, his comprehensiveness of mind, and power of discrimination. Without lowering other societies, he upheld the Royal Society as the elder brother, and its Transactions as the most proper place for the publication and preserving of important discoveries in all the branches of natural knowledge. He wished that as they had been hitherto, so they should continue to be the record of British science. The concluding part of this address is so characteristic of the tone of his mind, and of the views and hopes he delighted to indulge in, that I shall transcribe it: —

"Gentlemen, to conclude. I trust in all our researches we shall be guided by that spirit of philosophy, awakened by our great masters, Bacon and Newton; that sober and cautious method of inductive reasoning, which is the germ of truth and permanency in all the sciences. I trust that those amongst us who are so fortunate as to kindle the light of new discoveries will use them, not for the purpose of dazzling the organs of our intellectual

vision, but rather to enlighten us, by showing objects in their true forms and colours; that our philosophers will attach no importance to hypotheses, except as leading to the research after facts, so as to be able to discard or adopt them at pleasure, treating them rather as parts of the scaffolding of the building of science than as belonging either to its foundations, materials, or ornaments; that they will look, where it be possible, to practical applications in science, — not, however, forgetting the dignity of their pursuit, the noblest end of which is to exalt the powers of the human mind, and to increase the sphere of intellectual enjoyment, by enlarging our views of nature, and of the power, wisdom, and goodness of the Author of Nature.

“Gentlemen, the Society has a right to expect from those amongst its Fellows gifted with adequate talents, who have not yet laboured for science, some proofs of their zeal in promoting its progress; and it will always consider the success of those who have already been contributors to our volumes as a pledge of future labours.

“For myself, I can only say, that I shall be most happy to give, in any way, my assistance, either by advice or experiments, in promoting the progress of discovery; and though your good opinion has, as it were, honoured me with a rank similar to that of general, I shall always be happy to act as a private soldier in the ranks of science.

“Let us then labour together, and steadily endeavour to gain, what are, perhaps, the noblest objects of ambition — acquisitions which may be useful to our fellow-creatures. Let it not be said that, at a period when our empire was at its highest pitch of

greatness, the sciences began to decline; let us rather hope that posterity will find in the Philosophical Transactions of our days, proofs that we were not unworthy of the times in which we lived."

This discourse was published in 1827, with five others, which were successively delivered at the opening of the winter session of the Society, when the award of its medals is decided by the President and Council, and these are presented to the individuals distinguished from the Chair. In delivering a discourse on these occasions, he merely persisted in doing what his predecessors in office had before done; but he was, I believe, the first President of the Society who noticed publicly the Fellows deceased during the year, and briefly described their character and merits as men of science. This he did not only to indulge his own kind feelings, and, as far as possible, contribute to the rendering of just honours to deceased worth, but also for the purpose of keeping alive the spirit of philosophical inquiry, and the love of scientific glory, "and of kindling and perpetuating that flame of science which in the Royal Society ought to be undying." How he executed this task may be seen in the published Discourses, which were printed as they were delivered. They constitute good specimens of his style of oratory, and remind me forcibly of his lectures in the theatre of the Royal Institution; but the mere reader of them will form but an imperfect idea of their effect when delivered on an occasion appropriate, in the tone of voice and animation which the occasion called forth, addressed to individuals honoured by the highest marks of respect the Society can show, and to an audience capable of appreciating the justness of every

remark ; and in the instance of the eulogies spoken on lately deceased Fellows, sure of awakening kindred sympathies, and the kind and tender recollections of a large part of his audience. Whether they had any effect beyond that of pleasing and moving the minds of those to whom they were addressed, it is not easy to say ; but in their published state, I would hope that they may be permanently useful in the way he intended, and tend to preserve the dignity of science, and call generous minds to those excellent and exalted pursuits which, like every thing good, are their own reward,—delight in action, please in contemplation and recollection, and in application are of the highest utility.

The meetings of the Society this year were unusually well attended. Some of the Fellows who had withdrawn during the time of Sir Joseph Banks, owing to the angry contentions which took place in the early period of his presiding, now resumed their attendance ; and general harmony and apparent satisfaction prevailed amongst a body of men, so numerous, and of such different tastes and pursuits in literature and science, that it is too much to expect they will consider their interests the same, or even the interests of science, and be for any length of time contented with any President. As it had been the custom of former Presidents to observe a certain state in all that related to their office, conceiving, no doubt, that it helped to maintain its dignity and respectability, my brother did not depart from their example, and he continued to take the chair in a full court dress ; to have the splendid mace of office placed on the table before him, and to sit covered.

His predecessor had for many years an evening

party at his own house, for the purpose of assembling men of science, and affording them an opportunity of meeting each other at a fixed time and place. My brother continued this practice, changing only the evening of the meeting from Sunday to Saturday; the former appearing objectionable to some individuals, and he preferring one to which no objection could be made, especially of the serious kind, of interfering with a day which should be set aside for devotional purposes. These evening parties were very similar to those of Sir Joseph Banks; and as long as I was in England, they were crowdedly attended, and were very agreeable, amusing, and useful. They brought together, not merely men of science, but also literary men, poets, artists, country gentlemen; and they were very attractive to foreigners. The subjects of interest of the day were there discussed, and curious information obtained from the best sources, and knowledge exchanged between individuals, as in a great mart of traffic, each giving and receiving according to his acquirements and wants. There the physiologist and naturalist might collect curious particulars from an African traveller, or Arctic navigator, respecting many objects of his particular inquiries, and give hints for further investigation, or solve questions which might have perplexed the original observers. An evening seldom occurred without some novelty in art, science, or nature, being brought forward—as the bones from the Kirkdale Cave, or a new chemical compound, or a magnetical experiment, or a recently discovered mineral, or some new instrument or apparatus; and a great zest was given by the presence, as was generally the case, of the inventor or discoverer, who was always willing to

offer explanation, and give detailed information to those who were desirous of receiving it. And, moreover, a stimulus was thus imparted — a fresh excitement to the mind to continue and perfect useful investigations; and aids were often given which greatly contributed to the successful termination of scientific labours.

In these parties the distinctions of society seemed very much to be lost in the distinctions which science and merit confer. Men of the highest rank in the country mingled with men without any claim to notice, excepting that high one of superior knowledge; and it was a noble thing to see how much more attractive it was, and more honoured, than the highest nobility destitute of this qualification. I remember one evening, when the company was reduced to a small number by the lateness of the hour, and those who remained had collected round the fire, one of the party, I believe it was Dr. Young, observed in playful remark, "Ah! I perceive all here are doctors;" and so it proved; there being two or three doctors of physic — one, I believe, of divinity, and three of civil laws; and of these last two were baronets, and one was an earl, who, though distinguished for his high bearing on ordinary occasions, on this occasion seemed pleased to be considered of the same grade as the rest.

At this time my brother resided in Lower Grosvenor Street, No. 28.; and as long as he remained in that house, he continued to give these weekly evening parties during the session of the Society. Afterwards, when he removed to 26. Park Street, Grosvenor Square, in 1826, they were discontinued; and, as a substitute, the library of the Royal Society in its

apartments, at Somerset House, was opened on Thursday evenings, after the regular meeting was concluded, where the Fellows and visitors could converse familiarly on matters of science. What were my brother's motives for giving up his evening parties I was never accurately informed, being abroad at the time. I conjecture that several circumstances, which it is unnecessary to describe, influenced him on this occasion. I know that when he first became President, he attached some importance to these social meetings, and it was his wish to have made them as agreeable as possible, and as attractive; and to have opened the drawing-room to them, so that ladies might not be excluded; but this he could not effect; and perhaps it might have failed had it been attempted. The parties would probably have gained less in gracefulness, ease, and vivacity, than they would have lost in usefulness, zeal, and interest in matters of science. It is to be feared that they would have become fashionable assemblies, rather than scientific meetings. So long as his health permitted, he continued to give the dinners which were expected from him as President, to which were invited principally the working Fellows of the Society. The plate which was used on these occasions was very appropriate, consisting chiefly of honorary plate, and principally of the handsome service which was presented to him in 1817, by the great proprietors of collieries in the North of England, for his discovery of the safety lamp.

My brother commenced his Presidential duties with a high sense of their importance, and a sanguine expectation and desire of promoting the interests of the Royal Society and of Science. Whilst he was in

office the reputation of the Society was certainly not diminished, but was rather exalted ; the desire to belong to it was increased ; its Transactions were scarcely at any former time more original or interesting ; and at no former period was there more harmony in the general body of the Fellows. And yet, I believe, my brother's expectations were not answered, and he effected very much less than he wished. Government was lukewarm or indifferent in matters of science, and gave him no effectual support ; when requiring the aids of science, and of the Fellows of the Royal Society, applying to him without hesitation, and, when their objects were attained, forgetting the services. It was his wish to have seen the Royal Society an efficient establishment for all the great practical purposes of science, similar to the college contemplated by Lord Bacon, and sketched in his *New Atlantis* : having subordinate to it the Royal Observatory at Greenwich, for astronomy ; the British Museum, for natural history in its most extensive acceptance ; and a laboratory founded for chemical investigation, amply provided with all means requisite for original inquiry, and extending the boundaries and the resources of this most important national science. I remember well his speaking to me more than once on the subject. He had even the idea of raising the funds necessary for forming a laboratory by subscription amongst the Fellows themselves, without the aid of government ; and he probably would have attempted this and some other plans for the advancement of science, had his health remained firm.

As regarded satisfaction and pleasure to himself in his official situation, I fear he was much disappointed, and particularly latterly, when he was least able to

bear annoyances. He had no idea of manœuvring or managing, and never shrank from responsibility. On him fell the odium of all measures which hurt the feelings of individuals, whether in consequence of the rejection of a paper*, which the author supposed was worthy of a place in the *Philosophical Transactions*, or the black-balling of a candidate, ambitious of becoming a Fellow, and, of course, considering himself deserving of that distinction. As no wound, perhaps, rankles more and is more vexatious than that of personal vanity, so no class of people are more harassing and annoying than those thus offended; and it is from these that a President of the Royal Society is most exposed to attacks, — persons commonly without any dignity of character, and generally without real ability, and, consequently, feeble and irritable.

* When the above was written, I believed that an inquirer, contributing a paper to the Royal Society, was at liberty to withdraw it, if he thought proper — either if not satisfied with the decision of the Council respecting it, or from any other motive; but now I am sorry to find that it is not so, and that every paper received is considered by the officers of the Society as unconditionally offered, as having become the property of the Society, and to be disposed of as the Council may decide, independently of the wishes of the author. How long such a regulation has existed I know not. Some years ago, when I was better acquainted with the Royal Society, if it did exist it was as a dead letter, and was not acted on; and, for the interests of science, and the credit and quiet of the Society, I wish it were similarly considered now, or, what would be better, abrogated entirely. If a paper is not considered by the Council fit for publication in the "*Transactions*," why should it not be returned to the writer of it, especially if he requests it? It is no satisfaction to him to be informed by the Secretary that his paper is to be deposited in the archives of the Society, which is, virtually, its sepulchre. He communicated it for a different purpose, — for publication; and when we see how the Council of the Society is constituted, occasionally, as has happened of late years, without a single distinguished man in certain departments of science (I particularly allude to chemistry), can any proceeding be more unjust, or, as before said, contrary to the interests of science? Dr. Well's admirable Essay on Dew, and, as it is reported and believed by his countrymen, Franklin's Letters to Mr. Collinson on Electricity, written for the Royal Society, were not allowed

The man of real ability or of true dignity would be above the Royal Society, and would not condescend to resent any act of injustice towards him, supposing the decision of the President and Council to be unjust. He has the world for his tribunal; and it is only necessary for him to publish the results of his inquiries, and he is sure to have justice done to him. Another source of annoyance, belonging to the office of President, is that of the perpetual interruption of his leisure from applications by letter and personally, without end, respecting trifling inventions, supposed by their authors to be important discoveries, respecting patents and certificates for patents, and about imaginary discoveries and schemes worthy of Bedlam, and generally proposed by men of unsound, and often insane mind. To be thus deprived of time, and to have attention and patience wearied, must have been disagreeable to any man, excepting of a trifling character, and to my brother it was particularly wearying, and it even interfered with his own pursuits, and deprived him very much

to appear in the Philosophical Transactions: how deplorable it had been if the rule now complained of had been then acted on to the suppression, or even to the occasioning any material delay in the publication, of such important discoveries! The advocates of the new rule, perhaps, in vindication may say that in the "Proceedings of the Royal Society" now printed, every paper read at the meetings of the Society is noticed, and so brought before the public, even though not admitted into the Transactions. The fact of the notice cannot be denied; but in what an unsatisfactory manner in some instances has this notice been made!—a formal and empty outline, excluding all that was peculiar and new, which gave value to the communication, as if intended for proof of worthlessness. To render an account of a scientific paper may appear an easy matter; to a competent person it is so, who understands the subject, and only to him, whose knowledge enables him to point out what is original, and whose sense of right compels him to do justice to the author.

of the leisure which he might have devoted to original research. As an honorary situation, without profit or emolument of any kind, but occasioning considerable expense to the individual, a stranger to the nature of its duties would suppose the office of President of the Royal Society, for a man of science, not only the most elevated but the most agreeable possible. It undoubtedly should be so ; but it never can be so, as long as pretension to knowledge, vanity, and presumption, are more common (and they will always be more intrusive) than real knowledge, modesty, and diffidence. The pleasures of office, and especially of honorary office, are generally in anticipation and imaginary — the trials and troubles, real and incessant. These are the rocks and glaciers, the storms and torrents of the Alpine heights ; the other, the rosy hues of reflected light, lost on near approach, — to be seen only in the distance, at which all asperities are invisible.

CHAPTER IV.

LETTERS TO HIS BROTHER. — RESEARCHES ON ELECTRO-MAGNETISM. — LETTER TO HIS MOTHER. — EXTRACT FROM NOTE-BOOK EXPRESSIVE OF STATE OF MIND. — FURTHER RESEARCHES ON ELECTRO-MAGNETISM. — EXCURSION TO IRELAND. — EXPERIMENTS ON THE ELECTRICAL PHENOMENA EXHIBITED IN VACUO. — HIS LAST VISIT TO HIS NATIVE PLACE. — LETTER TO HIS FRIEND MR. POOLE. — RESEARCHES ON THE FLUIDS IN THE CAVITIES OF CRYSTALLINE MINERALS. — LETTER TO HIS BROTHER FROM SCOTLAND. — VERSES ENTITLED "THE EAGLES." — A NEW PHENOMENON OF ELECTRO-MAGNETISM. — HIS SUGGESTION TO MR. FARADAY, WHICH LED TO THE DISCOVERY OF THE LIQUEFACTION OF MANY OF THE GASES. — PROPOSAL FOR THEIR APPLICATION AS MECHANICAL POWERS. — HIS RIGHTS ON THE SUBJECT VINDICATED. — LETTER TO MR. EDMUND DAVY FROM SCOTLAND. — LETTER TO HIS BROTHER. — VERSES ON LORD BYRON WHILST LIVING. — VERSES ON HIM AFTER HIS DEATH. — VERSES WRITTEN AT ARBURNHAM.

To return to the narrative previous to his election as President to the Royal Society. After spending about a fortnight with my brother in London, I left him to go into Cornwall on a visit to my mother; the affairs of the Society detained him in town some time longer. The following letter I had from him on his way to Scotland: —

" Nottingham, August 6.

" MY DEAR JOHN,

" I am much obliged to you for your letter from Penzance, and I am happy to hear so good an account of my mother.

" Pray address your next letter to me under cover to William Rose, Esq., Clerk to the House of Lords, Melrose, N. B. We are travelling together.

"I shall be very glad to learn what is the temperature of the surface of the water in a deep mine full of water. I wrote to you from Cobham, stating that the Duke of Somerset has declined the contest for the chair of the R. S. I hardly think that any new claimant will appear.

"I am going to breathe some fresh air upon the moors, and I think I cannot be so near the Tweed without wetting my line in it.

"You probably will be now employed upon your work on the Island of Ceylon. The more you give of personal narrative the better. Men read with pleasure adventures in foreign countries, because it is impossible to anticipate moral circumstances; whereas philosophical principles, and facts depending upon general laws, may be calculated on in all climates. With love to my mother and sisters,

"I am, my dear John,

"Always your affectionate Brother and Friend,

"H. DAVY."

The next letter was written in returning: —

"Rokeby, Sept. 28.

"MY DEAR BROTHER,

"Many thanks for your letter. Pray endeavour to ascertain the depth of water in the Cornish mines you tried, and the temperature at the surface *as it gets colder*. This, and the temperature at the bottom, will offer decided evidence as to whether there is any source of heat below. If, for instance, when the atmosphere is 32° there should be a great difference between the temperature of a mile 100

feet deep and one 1000 feet deep, the fact would be decisive.

"I shall be in town about the 15th October. Pray address your next letter to me there. As all opposition to my election is at an end, I am in no anxiety to return to London, and I shall take holidays while I may. Pray remember me with all duties and affections to my relations and friends.

"I am, my dear John,

"Very sincerely yours,

"H. DAVY."

The observations which I made on the temperature of mines which had been forsaken, and were full of water, according to my brother's request in this last letter, were rather in opposition to the idea that there is an internal source of heat; and, keeping them in recollection, I cannot help feeling some little doubt relative to the truth of this hypothesis; and to the correctness of what is now generally considered as an established fact, that the temperature of the earth invariably increases with its depth, or from its circumference towards its centre. May it not be asked, in accordance with this view, why are not all springs hot springs? Why is the temperature of water at the bottom of very deep lakes generally, and of the ocean at great depths even within the tropics, about 40° Fahrenheit? Further inquiry may afford answers to such questions not inconsistent with the hypothesis; but, till this inquiry has been made, and the answers given, it may not be amiss to indulge some degree of scepticism on a subject of such great importance in its theoretical bearings, and confessedly enveloped in much mystery.*

* There is a striking passage in Gilbert's posthumous work already referred to, expressing his opinion of the temperature of the earth, when

It was his intention this autumn to have paid his friends in Cornwall a visit. When expecting his arrival at Penzance, I received from him the following letter : —

“ Grosvenor Street, Oct. 19.

“ MY DEAR JOHN,

“ I had intended to leave town for Cornwall to-morrow ; but I have been caught by an inquiry of the greatest importance, and till I can conclude I cannot stir.

“ I have ascertained (repeating some vague experiments of CErsted’s) that the *voltaiic pile* is a powerful magnet ; *i. e.* that by the union of the + and – electricities, magnetism is produced in the same combinations as heat. I am deeply occupied with this, which promises to explain so much for the theory of the earth : do not say anything on the subject. I hope in two or three days to be able to give you the whole details, of which you will immediately perceive the importance. Faraday has discovered a combination of chlorine and charcoal.

“ Sir E. Home has made out the use of the pigmentum nigrum. I write from the table where I am *magnetising*. I rejoice your book is so far advanced.

“ If I can conclude my labours by the 24th, I will come down before the session of the R. S. If not,

opposing a notion of that time : — “ Quid tempus perderem probando elementum ignis undique juxta Lunæ sphaeram non esse? Contrarium à nulla pendet ratione, magnoque sensus nostri judicio id falsum esse persuaderi potest. Ut neque altiora à tellure, calidiora leviorave sunt; nam, à superioribus locis nubes et grandies decidunt, frigusque perpetuum est in altissimis montibus, in minus altis minus frigus, qui tamen frigidiores sunt quam planities: et planities convallesque frigidiores sunt interioribus terræ partibus, in quibus nec glacies, nec pruina, sed tepores, calores, etiam et incendia.”—Op. Cit. p. 21.

we shall meet about the 25th, for you must come to town to assist in putting me into the chair.

“ I am, my dear John,

“ Very sincerely,

“ Your affectionate Friend and Brother,

“ H. DAVY.”

The knowledge of the experiments of M. Œrsted, alluded to in the preceding letter, he obtained, I believe, at second-hand by a letter from a friend at Geneva. I mention this to explain his applying the epithet vague to them, which he would not have used, had he then been acquainted with the original notice by which the discovery of the Danish philosopher was communicated to the scientific world. This discovery, in its consequences hardly inferior to the great discoveries in electricity which have immortalized the names of Franklin and Volta, was very simple in its nature ; viz., that when the extremities of a voltaic pile or battery are united by a perfect conductor, as a metallic wire, and the compass is brought near it, the needle is attracted by the wire, and may be made to deviate from its natural direction.

This leading fact my brother immediately verified ; and, reasoning upon it, he inferred that the uniting wire itself, during the passage of the electricity through it, must have become magnetic, which was confirmed by experiment. He found that it attracted powerfully iron filings, like a magnet ; and further, that if the battery was divided, and the separate parts were joined by wires, each wire had the same power ; whence the expression in his letter, that the battery is a powerful magnet. He did not stop here ; guided by the same process of analogical reasoning, he formed permanent magnets by means of vol-

taic electricity; and finding that the magnetising power of the voltaic battery, like its heating power, is proportional to the quantity of electricity transmitted, it occurred to him that it would also be exhibited by common electricity, when accumulated in the Leyden battery, which, on trial, proved to be the case. Lastly, speculating on the facts which he had ascertained, he conjectured that the magnetism of the earth may be owing to electricity; and the variations of the needle to the alterations in the electrical currents of the earth, in consequence of its motions, internal chemical changes, or its relations to solar heat; and that the auroras at the poles may depend on the same cause.

These facts and speculations he brought forward in his first communication on the subject to the Royal Society, dated November 12., with a suggestion of practical application for making powerful magnets, by attaching bars of steel transversely to lightning conductors.*

His speculations he merely offered as conjectures, though, I believe, he was tolerably convinced they were true; as has since been almost demonstrated in regard to the most important of them. This conviction he expresses in a letter to me, written the day after his paper was read: he says, "I think I have nearly a direct proof that the magnetism of the earth depends on electricity." And in his paper he observes, "This is evident, that if strong electrical currents be supposed to follow the apparent course of the sun, the magnetism of the earth ought to be such as it is found to be." Relative to the nature of magnetism he did not venture to give an opinion,

* Phil. Trans. for 1821.

excepting so far as to express doubt of magnetism and electricity being identical, founded on remarkable difference of qualities exhibited by them; such as the magnetic influence of the voltaic and of the Leyden battery passing equally through conductors and nonconductors of electricity, and producing its effects at a considerable distance with the same readiness through air and water, glass, mica, or metals. He attempted to produce chemical effects by magnetism; but, as he states, without success. I mention this to show the extended and rapid view he took of the subject, and with what facility he applied himself to the interrogation of nature.

The following letter was written shortly after his election, expressing his feelings on the death of a near relation, his mother's sister (after a severe and lingering illness), and his sentiments in relation to his elevated appointment; and enclosing a bank note of 10*l*, which it was his custom to send to be distributed in little Christmas presents: —

“Dec. 22.

“MY DEAR MOTHER,

“My sister's letter of this morning gave me very sincere grief. I had long been afraid that my aunt Millett would not recover; but, from John's account, I still had hopes of seeing her again. Alas! these hopes are gone; but I trust that excellent and worthy woman is enjoying a more perfect state of happiness than belongs to this chequered and uncertain life.

“I beg you will give my kindest love to my aunt Sampson, and express my deep concern at her illness. * * * * *

“ I shall enclose a 10*l.* note, which I beg you will lay out in the way you think best, for my sister's children, and any *old pensioners* that knew me in youth remaining; but I believe they are all gone down the stream of time.

“ I thank you for your congratulations on my election to the highest situation a scientific man can fill. I hope it will increase my means of being useful to my fellow creatures and my country. With kind love to my sisters,

“ I am, my dear Mother,

“ Very sincerely, your affectionate

“ H. DAVY.”

I am tempted to give an extract from one of his note books, in which he has committed to writing, with strong expression, the feelings of his mind, marking the same religious tone as the preceding letter, and desire to be useful, accompanied with a fervour of thankfulness for benefits received, and a submission of self, which could only be expressed “ in secret.” I shall copy what he has written down verbatim : —

“ It is now eleven years since I have written anything in this book; I take it up again, February 17. 1821. I have gained much since that period, and I have lost something; yet I am thankful to Infinite Wisdom for blessings and benefits; and I bow with reverence beneath his chastisements, which have been always in mercy. May every year make me better, — more useful, — less selfish, — and more devoted to the cause of humanity and science!”

This winter, and the following spring, much of his time was necessarily occupied in his new duties of

President of the Royal Society. He still continued, however, to work in the laboratory; and at the last meeting of the Society in July, which closed the session, another paper of his was read, entitled, "Farther Researches on the Magnetic Phenomena produced by Electricity, with some New Experiments on the Properties of Electrified Bodies in their Relations to Conducting Powers and Temperature."*

This paper is a happy instance of inductive research and of the progress of an inquiry from fact to principle, and from principle to new facts of a very marvellous kind. I shall give a few instances only in illustration, relating chiefly to the conducting power of metals.

He found this power in different metals to differ much more than he had expected. "Thus, six inches of silver wire of $\frac{3}{16}$ discharged the whole of the electricity of sixty-five pair of plates of zinc and double copper, made active by a mixture of about one part of nitric acid of commerce and fifteen parts of water; six inches of copper wire of the same diameter discharged the electricity of fifty-six pair of the same combinations; six inches of tin of the same diameter carried off that of twelve only; the same quantity of wire of platinum that of eleven, and of iron that of nine."

He found "the higher the intensity of the electricity, the less difficulty it had in passing through bad conductors;" which was displayed in several remarkable phenomena. "Thus, in a battery where the quantity of the electricity is very great and the intensity very low, such as one composed of plates of zinc and copper so arranged as to act only as

* Phil. Trans. 1821.

single plates of from twenty to thirty feet of surface, and charged by a weak mixture of acid and water, charcoal made to touch only a few points is almost as much an insulating body as water, and cannot be ignited; nor can wires of platinum be heated when their diameter is less than $\frac{1}{36}$ of an inch, and their length three or four feet; and a foot of platinum wire of $\frac{1}{36}$ is scarcely heated by such a battery, whilst the same length of silver wire of the same diameter is made red hot, and the same lengths of thicker wires of platinum intensely heated."

He found that the *conducting power of metallic bodies is lower, in some inverse ratio, as the temperature is higher*. This was the most remarkable general result of his inquiries; the effects, he observes, must appear almost impossible till they are witnessed.

"Thus, let a fine wire of platinum of four or five inches in length be placed in a voltaic circuit, so that the electricity passing through it may heat the whole of it to redness, and let the flame of a spirit-lamp be applied to any part of it, so as to heat that part to whiteness; the rest of the wire will instantly become cooled below the point of visible ignition.

"For the converse of the experiment, let a piece of ice, or a stream of cold air, be applied to a part of the wire; the other parts will immediately become much hotter, and from a red will rise to a white heat. The quantity of electricity that can pass through that part of the wire submitted to the changes of temperature is so much smaller when it is hot than when it is cold, that the absolute temperature of the whole wire is diminished by heating a part of it, and *vice versa* increased by cooling a part of it."

Lastly, he found that the generation of heat by

electricity, in the instance of the metals, is nearly inversely as their conducting powers. One striking example may be given in illustration, both for its own sake and the comment made on it : —

“ If a chain be made of wire of platinum and silver, in alternate links soldered together, the silver wire being four or five times the diameter of the platinum, and placed in a powerful voltaic circuit, the silver links are not sensibly heated, whilst all those of the platinum become intensely and equally ignited.” He remarks, “ This is an important experiment for investigating the nature of *heat*. If heat be supposed a substance, it cannot be imagined to be expelled from the platinum, because an unlimited quantity may be generated from the same platinum ; *i. e.* as long as the electricity is excited, or as often as it is renewed. Or, if it be supposed to be identical with, or an element of electricity, it ought to bear some relation to its quantity, and might be expected to be the same in every part of the chain, or greatest in those parts nearest the battery.”

Immediately after the closing of the Royal Society he left town to make a fishing excursion in Ireland, and revisit some of his favourite haunts in that country, which he told me he never entered without feeling his spirits rise, partly, no doubt, from the kindness of heart which he always experienced there, and partly from the original and diverting manner of the people.

I had the pleasure of accompanying him sufficiently far to see his remark verified. We set out the day before the coronation of his late Majesty, and spent the day of that splendid ceremony, which all the world was crowding to see, on the quiet and beautiful banks of Cotton’s “beloved Dove.” From thence

we travelled without stop to Port Patrick, and crossed to Donaghadee, with the hope (which was not realised, in consequence of the heat and dryness of the weather) of having some good salmon fishing in the Bush and the Bahn, two of the best salmon rivers in the north of Ireland. At Colerain we parted: he to pursue his tour in Ireland and the west of Scotland; and I to return to England, after having had the gratification of seeing, in company with him, that marvel of nature and problem in geology, the Giant's Causeway, which in his "Salmonia" he holds out as a recompense for anglers whom, like ourselves, the Bush may disappoint. "Should sport fail (he observes), the celebrated Giant's Causeway is within a mile of its mouth, and furnishes to the lovers of natural beauty or of geological research almost inexhaustible sources of interest."

On his return to town in the latter part of autumn, his most favourite time for scientific investigation, after the refreshment of air and exercise, and the agreeable relaxation of a country life, he entered upon an inquiry, which he hoped might aid in the development of the nature of the imponderable substances or energies of matter. The results he gave to the Royal Society in a paper which was read on the 29th of December, entitled "On the Electrical Phenomena exhibited in Vacuo."

But before I state what the results he obtained were (and I shall mention them only in the most general manner), it may be right to give some of his introductory remarks, as they convey a lively idea of the present imperfect and unsettled state of our knowledge on the subjects to which they relate.

He begins with observing — "The production of

heat and light by electrical discharges ; the manner in which chemical attractions are produced, destroyed, or modified, by changes in the electrical states of bodies ; and the late important discovery of the connection of magnetism with electricity— have opened an extensive field of inquiry in physical science, and have rendered investigations concerning the nature of electricity, and the laws by which it is governed, and the properties that it communicates to bodies, much more interesting than at any former period of the history of philosophy.”

He continues : — “ Is electricity a subtile elastic fluid ? or, are electrical effects merely the exhibition of the attractive powers of the particles of bodies ? Are heat and light elements of electricity, or merely the effects of its action ? Is magnetism identical with electricity, or an independent agent put into motion or activity by electricity ? Queries of this kind (he observes) might be considerably multiplied, and stated in more precise and various forms ; the solution of them, it must be allowed, is of the highest importance ; and, though some persons have undertaken to answer them in the most positive manner, yet there are, I believe, few sagacious reasoners who think that our present data are sufficient to enable us to decide on such very abstruse and difficult parts of corpuscular philosophy.”

He adds : — “ It appeared to me an object of considerable moment, and one intimately connected with all these queries — *the relations of electricity to space as nearly void of matter as it can be made on the surface of the earth* ; and, in consequence, I undertook some experiments on the subject.”

The experiments were effected in a very easy man-

ner by a simple apparatus : a curved glass tube, with one leg closed and longer than the other, in which fused fixed metals could be employed instead of fluids, which are known to afford vapour, and by means of which, with the aid of an air-pump, the most perfect Torricellian vacuum could be formed.

His results in relation to electricity and magnetism were, that they can exist in the most complete vacuum; their attractions and repulsions in vacuo being exercised much in the same manner as in the atmosphere. Whilst in relation to light, and probably heat, the inference from the experiments was, that they cannot exist in a perfect vacuum, both diminishing with the degree of perfection to which the vacuum was brought, and, in an imperfect vacuum, being modified according to the nature of the vapour in which they appeared.

For the details, both of the experiments and the reasoning connected with the results, I must refer the philosophical reader to the paper itself*, which is well worthy of his consideration, and is fitted, whilst it may lead to further inquiry, to check hasty generalisation and assertion on such mysterious subjects.

This winter my brother paid a visit to his family at Penzance, and spent about a week or ten days with them : though not intended to be so, it was a farewell visit, and the last time he saw his mother and his native place. The satisfaction he had on the occasion was more than usual; for, in addition to the natural pleasure of meeting old friends, and his nearest relations, he experienced from his townsmen an attention which was very gratifying to him; — he was ho-

* Phil. Trans. 1822, part 1.

noured by them with a public dinner. The following particulars are extracted from an account of this dinner which was published at the time in a Cornish paper:—

“ About fifty gentlemen sat down to an excellent dinner, and spent the evening with that cordiality, harmony, and exaltation of feeling, which all the circumstances of the scene were so well calculated to inspire. It was, indeed, a season of luxurious enjoyment, in the best sense of the words, and one not likely to be soon forgotten by any one of those who partook of its delights. On the one hand, every heart, tongue, and eye were as one to do honour to him who had not only rendered the name of their ~~town~~ famous and imperishable as science itself, but who had added lustre to the intellectual character of their *country*, and had won the still higher guerdon due to the happy few who can claim to be permanent benefactors of the human race. On the other hand, was the proud though unintentional triumph of genius, returning to its native home, adorned with the highest and most conspicuous honours which science and power can bestow, softened and subdued by the spontaneous, simple, and unanimous homage wherewith it was greeted; amid scenes which, fraught, as they were, with all the delightful and indelible associations of boyhood, were of themselves sufficient to give a warmth and tenderness to many things which, elsewhere, and in other circumstances, might have been overlooked as common.”

Whilst on this visit he addressed the following letter to Mr. Poole, expressing the state of his feelings, the revival of former ones, and in language of abstract terms very like what he indulged in in youth:—

“ To Thomas Poole, Esq.

“ Penzance.

“ MY DEAR POOLE,

“ An uncontrollable necessity has brought me here, close to the Land’s End. I am enjoying the majestic in nature, and living over again the days of my infancy and early youth.

“ The living beings that act upon me are interesting subjects for contemplation. Civilisation has not yet destroyed in their minds the semblance of the great Parent of Good.

“ Nature has done much for the inhabitants of Mount’s Bay, by presenting to their senses all things that can awaken in the mind the emotions of greatness and sublimity. She has placed them far from cities, and given them forms of visible and audible beauty.

“ I am now reviving old associations, and endeavouring to attach old feelings to a few simple objects.

“ I am, &c.,

“ H. DAVY.”

During the next year, 1822, he was less occupied than usual in scientific research, and he communicated one paper only to the Royal Society. It was entitled, “On the State of Water and Aëriform Matter in Cavities found in certain Crystals.”*

It occurred to him that the state of the fluid and elastic fluid contents of these cavities might aid the solution of some of the most interesting problems in geological science relating to the formation of the crystalline rocks, in which they are found; and the results which he obtained in examining them con-

* Phil. Trans. 1822.

firmed his conjecture. In the majority of instances he found the air in the cavities very much rarefied, and resembling azote in its properties, and the fluid water nearly pure. The only exceptions which he met with were two, which were very remarkable. In a specimen of rock crystal from La Gardette, in Dauphiné, he detected, instead of water, a brownish oily fluid ; and, instead of air, the vapour of the same fluid highly rarefied ; and in a crystal supposed to be from the Brazils, which contained water and air, the air, instead of being rarefied, was found in a contrary state, very much condensed.

Theoretically considered, these results appeared to him sufficiently explicit, and decidedly in favour of the Huttonian views of the formation of crystalline rocks, — the rarefied state of air and vapour included in the crystals indicating the operation of a high temperature at the moment of consolidation, as if from igneous fusion ; and the condensed state of air in one instance denoting, during the process of crystallisation, great compression. He concludes with observing, “ That a fact which has been considered by the Neptunists, above all others, as hostile to the idea of the igneous origin of crystalline rocks, namely, the existence of water in them, seems to afford a decisive argument in favour of the opinion it has been brought forward to oppose.”

During the summer he again went into Scotland ; and by the way visited, I believe, the Kirkdale Cave in Yorkshire, to see those organic remains which had been discovered a short time before, buried in clay, and sealed up by stalactite, bearing evidence to a diluvial catastrophe on the surface, hardly less demonstrative than the results of his researches just mentioned did

to the operation of fire in the depths of the earth, in the production of its crystalline rocks.

The following letter I received from him, from a distant part of the Highlands, where he had gone for the sake of fishing and shooting, and the pleasure of exploring wild scenery : —

“ Garve, Inverness, August 11. 1821.

“ MY DEAR JOHN,

“ I heard from Lady Davy that you had been in town, and that your voyage was put off *sine die*. I hope now that it will not take place till the winter is over, and that we shall meet again in the autumn. I shall certainly be in town about the middle or before the end of October.

“ I have had a rough but agreeable journey and voyage amongst the wildest parts of the Highlands—the west of Ross-shire. I have seen some beautiful lake scenery on Loch Maree, and caught some salmon, in spite of bad weather, in the river which runs from it into the sea, and which formerly was the best river for angling in Scotland ; but they have now placed the cruives close to the sea, and left only a single pool for the honest angler.

“ I shall take the campaign against the grouse here to morrow, on Sir George Mackenzie’s moors.

“ The Highland lairds are all marching, bag and bagpipe (not baggage), to Edinburgh, with as strong external expressions of loyalty as if they had never been Jacobites, and Scotland is all in commotion. I dined with Sir W. Scott the day before I left Edinburgh, who is, in fact, master of the royal revels ; and I was very much amused to see the deep interest he

took in the tailors, plumassiers, and show dressmakers, who are preparing this grand display of Scotch costume.

“ Pray address me, Post-Office, Blair Athol ; and believe me to be,

“ My dear John,

“ Your very affectionate Brother and Friend,

“ H. DAVY.”

It was, probably, during this excursion that he witnessed an interesting incident, which he has introduced in “ Salmonia,” in describing this part of the Highlands, namely, two eagles teaching their young to fly. He first recorded the circumstance in verse, as he was much in the habit of doing when an event impressed him associated with any peculiar train of thought. I shall transcribe the lines for the sake of the thought and its aspiration : —

“ THE EAGLES.

“ The mighty birds still upward rose,
In slow but constant and most steady flight,
The young ones following ; and they would pause,
As if to teach them how to bear the light,
And keep the solar glory full in sight.
So went they on till, from excess of pain,
I could no longer bear the scorching rays ;
And when I looked again they were not seen,
Lost in the brightness of the solar blaze.
Their memory left a type, and a desire :
So should I wish towards the light to rise,
Instructing younger spirits to aspire
Where I could never reach amidst the skies,
And joy below to see them lifted higher,
Seeking the light of purest glory's prize.
So would I look on splendour's brightest day
With an undazzled eye, and steadily
Soar upwards full in the immortal ray,
Through the blue depths of the unbounded sky,
Pourtraying wisdom's boundless purity.
Before me still a lingering ray appears,
But broken and prismatic, seen thro' tears,
The light of joy and immortality.”

In a letter to his mother, written just after his return to London, dated October 23., his kind and religious feelings are again called forth on the occasion of the death of our mother's eldest sister at an advanced age. He says, "I heard of my poor aunt's death from John. When I took leave of her I did not expect to see her again. She was always kind and good to me, and I felt very sincere grief for her loss; but the course of nature, and the decrees of Providence, are inevitable; and man has only to worship and obey."

During the Christmas holidays he went into Wales, where, as appears from his letters to Mr. Vivian, published by Dr. Paris, he gave part of his time to investigate the nature of the effluvia arising from the great copper works in the neighbourhood of Swansea in the operation of reducing the ores of copper, and to the most effectual means of correcting their noxious qualities.

This winter he made no communication to the Royal Society; but early in the spring of 1823 he gave a paper, which was read on the 6th of March, "On a New Phenomenon of Electro-Magnetism."* The following is his description of it in its most striking form, and of the apparatus by which it was produced:—

"I had two copper wires of about one-sixth of an inch in diameter, the extremities of which were flat and carefully polished, passed through two holes three inches apart in the bottom of a glass basin, and perpendicular to it; they were cemented into the basin, and made non-conductors by sealing-wax, except at their polished ends; the basin was then filled

* Phil. Trans. 1823, part 2nd.

with mercury, which stood about a tenth or twelfth of an inch above the wires; the wires were now placed in a powerful voltaic circuit. The moment the contacts were made, the *phenomenon*, which is the principal object of this paper, occurred; the mercury was immediately seen in violent agitation; its surface became elevated into a small cone above each of the wires; waves flowed off in all directions from these cones; and the only point of rest was apparently where they met in the centre of the mercury, between the two wires. On holding the pole of a powerful bar-magnet at a considerable distance (some inches) above one of the cones, its apex was diminished, and its base extended; by lowering the pole further these effects were still farther increased, and the undulations were feebler. At a smaller distance the surface of the mercury became plane, and rotation slowly began round the wire. As the magnet approached, the rotation became more rapid; and when it was about half an inch above the mercury, a great depression of it was observed above the wire, and a vortex which reached almost to the surface of the wire."

For farther particulars of this very remarkable phenomenon, and how he investigated it, I must refer to the paper itself. He avoided speculating on it, considering the science of electricity and magnetism not sufficiently advanced: in a cursory manner, however, he remarks, that the passage of the electricity through the mercury seems to diminish the power of gravitating, as, it might be added, under other circumstances it does its power of chemical union; and he also points out that *the phenomenon* is more favourable to the hypothesis of two

electricities than of one in deficiency and excess. Indeed, by Berzelius the experiment is considered as almost a demonstrative proof of the existence of two electricities.*

He concludes the paper by an act of justice to Dr. Wollaston, pointing out how the discovery of the rotations of the electro-magnetic wire round its axis by the approach of a magnet, realized by the ingenuity of Mr. Faraday, had been anticipated and even attempted by Dr. Wollaston in the laboratory of the Royal Institution.

The week after this paper was read, my brother communicated a paper by Mr. Faraday "On Fluid Chlorine;" that is, the gas condensed into the liquid state.

The history of this interesting discovery is briefly as follows. According to Mr. Faraday, when he was engaged in examining the hydrate of chlorine my brother suggested to him the experiment of exposing this substance to heat in a closed glass tube, with the expectation, stated in a note appended by him to Mr. Faraday's paper, "that one of three things would happen: that it would become fluid as a hydrate; or that a decomposition of water would occur, and euchlorine and muriatic acid be formed; or that the chlorine would separate in a condensed state."†

Mr. Faraday complied with the suggestion, and the result was a decomposition of the hydrate of chlorine, and a condensation of two fluids: one an aqueous solution of chlorine; the other chlorine uncombined, which had the appearance of an oil, and

* *Traité de Chimie*, vol. i. p. 191.

† *Phil. Trans.* 1823, part 2d.

which, when the tube was broken, suddenly returned to the state of gas.

This fact, the merit of establishing which is due to Mr. Faraday, as much so as that of establishing the rotary motion already alluded to, immediately gave rise to an extension of the inquiry, in working out which my brother was guided by his usual analogical mode of reasoning.

He next tried to render muriatic gas liquid, and he effected it in a very simple way, — “by sealing muriate of ammonia and sulphuric acid in a strong glass tube, and causing them to act on each other,” — one portion of the gas generated, compressing and condensing the other.

To this condensing agency of gas, generated in close vessels, aided by heat at one end, as at the other it might be by cold, there appeared to be no limit, excepting the strength of apparatus. He was naturally, therefore, sanguine in expectation of similar success with other gases by employing the same means.

Mr. Faraday, at his request, continued the experiments, and actually did succeed in obtaining in the liquid state sulphurous acid, sulphuretted hydrogen, carbonic acid, euchlorine, nitrous oxide, cyanogen, and ammonia; but failed in condensing hydrogen, oxygen, fluo-boracic, silicated fluoric, and phosphuretted hydrogen gases.*

These results were communicated to the Royal Society on the 10th of April; and at the following meeting a paper of my brother's was read, “On the Application of Liquids formed by the Condensation

* Phil. Trans. 1823, part 2d.

of Gases as Mechanical Agents." He thus prefaces the inquiry : —

“ One of the principal objects I had in view in causing experiments to be made on the condensation of different gaseous bodies by generating them under pressure, was the hope of obtaining vapours which, from the facility with which their elastic powers might be diminished or increased by small decrements or increments of temperature, would be applicable to the same purposes as steam.”

He adds, — “ As soon as I had obtained muriatic acid in the liquid state, a body which M. Berthollet supposed owed its power of being separated from bases by the acids only to the facility with which it assumes the gaseous form, I had no doubt, as I mentioned in my last communication, that all the other gases which have weaker affinities or greater densities, and which are absorbable to any extent by water, might be rendered fluid by similar means; and that the conjecture was founded, has been proved by experiments, made with so much industry and ingenuity by Mr. Faraday, and which I have had the pleasure of communicating to the Society.”

In explanation of his hopes on the application of the new liquids, he remarks — “ The elasticity of vapours in contact with the liquids from which they are produced under high pressures by high temperatures, such as those of alcohol and water, is known to increase in a much higher ratio than the arithmetical one of temperature; but the exact law is not yet determined, and the result is a complicated one, and depends upon circumstances which require to be ascertained by experiment. Thus, the ratio of the elastic force dependent upon pressure is to be

combined with that of the expansive force dependent upon the temperature ; and the greater loss of radiant heat at high temperatures, and the development of latent heat in compression, and the necessity for its re-absorption in expansion (as the rationale of the subject is at present understood), must awaken some doubts as to the economical results to be obtained by employing the steam of water, under very great pressures, and at very elevated temperatures.

“ No such doubts, however, can arise with respect to the use of such liquids as require for their existence even a compression equal to that of the weight of thirty or forty atmospheres ; and where common temperatures, or slight elevations of them, are sufficient to produce an immense elastic force ; and when the principal question to be discussed is, whether the effect of mechanical motion is to be most easily produced by an increase or diminution of heat by artificial means.” *

The experiments which he made on this subject answered his most sanguine expectations (I must refer the reader for a detail of them to the paper itself), and induced him to hope, that the mere difference of temperature between sunshine and shade, and air and water, or the effects of evaporation from a moist surface, will be sufficient to produce results which have hitherto been obtained only by a great expenditure of fuel.

Whether these views will ever be realised, can only be determined by experimental investigation. Should they be realised, the imagination is almost startled at the consequences ; the accession of power to man would

* Phil. Trans. 1823, part 2d.

be so enormous, — as much exceeding any power even at present available, as the force of steam, the great power of these times, is superior to any agency previously known, and the advantages that would accrue to society would of necessity be commensurate.

Before I quit the topic of the condensation of the gases, I consider it right to state that the account which Dr. Paris has given in his work of the manner in which the discovery was made is partial, and, as it appears to me, incorrect and unjust, and not borne out by the published statements either of Mr. Faraday or my brother. Dr. Paris asserts that Mr. Faraday must have made the discovery of the condensation of chlorine into the fluid form, if left to himself. What he might have done it is impossible to say; considering his ingenuity and activity, it is probable he would have effected it. But this is certain, that the discovery was made in consequence of the suggestion he received; and the suggestion was offered with a view to the result obtained.

Dr. Paris's narrative imparts to the reader the impression, that Mr. Faraday was very unjustly treated; that Sir Humphry Davy took advantage of his situation, and endeavoured to appropriate to himself part of the merit of a discovery to which he was in nowise entitled. This is insinuated, not expressly stated, and it has required to be repelled. It was not in my brother's nature to assume to himself another man's merit; he was infinitely above such meanness of conduct; and I am surprised that Mr. Faraday has not come forward to do him justice. As I view the matter, it appears hardly less necessary to his own honest fame than his acknowledgment to Dr. Wol-

laston, on the subject of the first idea of the rotary magnetic motion.

In July, after the termination of the meetings of the Royal Society, my brother made an excursion into Ireland and Scotland, with his distinguished friend, Dr. Wollaston, who was hardly less fond of angling, though he had acquired a taste for the diversion late in life, as is mentioned in a note to Salmonia. A letter to Mr. Edmund Davy, dated Glasgow, September 1., in answer to some inquiries relative to a plan for preventing the forgery of notes, briefly mentions their course of travel, and explicitly states the part Mr. Faraday performed in the inquiry on the condensation of the gases : —

“ Glasgow, Sept. 1. 1823.

“ DEAR SIR,

“ I have been waiting ever since I received your letter, which reached me when I was at Ballina, in the county of Mayo, in hopes of being able to inclose an answer to it, under the cover of a Member of Parliament ; but having been since principally in the wildest parts of the north of Ireland, I have had no opportunity, and I therefore put you to the expense of postage.

“ Mr. Perriere’s plan does not appear to me likely to be successful. Dr. Wollaston, who was travelling with me, was of the same opinion. I conceive it could be very easily imitated, so as to deceive the eye of a common observer, as it has not even the delicacy of workmanship which characterises some other inventions, in which the stamp is of the same complicated kind. What the ingenuity of men can invent the ingenuity of men can imitate.

“ I have been visiting some of the wildest spots in Mayo and Donegal, and have again and again been studying the mysterious basaltic arrangements of Antrim ; but I almost despair of any adequate theory to account for the phenomena.

“ I congratulate you on the increase of your family, and I trust your marriage has added to your happiness.

The experiments on the condensation of the gases were made under my direction ; and I had anticipated, theoretically, all the results. My object, which I hope will be attained, was a new moving power.

“ I shall be very glad, at any time, to receive any experiments of yours (which will add to your reputation) for the Royal Society.

“ I hear with much satisfaction that your lectures, both at Bristol and Cork, were very popular, and very well received.

“ I am, dear Sir,

“ Very sincerely yours,

“ H. DAVY.”

On his return to town I received from him the following letter, in which the first indications appeared of that malady from which he afterwards suffered so much, and which ultimately proved fatal ; offering a remarkable instance of the insidious manner in which some complaints are formed : —

“ October 30. 1823.

“ MY DEAR JOHN,

“ I received your letter from Edinburgh, and I am very glad you arrived safe, and had a pleasant

passage. I envy you the power of bearing a sea voyage; I suffer not only at the time, but some days after, which, I believe, is owing to an irritable or diseased state of my liver, or some of the organs connected with it.

"I have not been well since my return to town: I have my usual autumnal affection of the stomach and bowels. I have had pains, apparently not inflammatory, in my hands and feet: can this be gout, or is it merely symptomatic of the state of the stomach?"

* * * * *

"Dr. Wollaston is nearly well of his wound, which has given him a good deal of pain. The explosion was from a *common* powder-horn; but he cannot explain at all how.

* * * * *

"I am, my dear John,

"Very affectionately yours,

"H. DAVY."

Belonging to this precise period, little occurs in his note-books to extract in verse, and still less in prose. Some lines which he wrote this year on Lord Byron may be acceptable to the reader, especially in connection with some others which he composed the following year; the one on this great genius living, the other dead — portraying his impression of his character and powers, feelings and aspirations, written from more than common knowledge of the poet and the man; with a perception equally of his great blemishes and irregularities, and of his extraordinary excellencies.

" LORD BYRON.

" WRITTEN WHILST LIVING.

" 1823.

" Altho' thy youthful and luxuriant wreath,
 Of splendid and most glorious hues, was woven
 From all the fairest, sweetest flowers of spring,
 Yet some strange blossoms and some poisonous weeds
 Were mingled with the jasmine and the rose,
 And the sweet orange flower ; and thy dark locks
 In curling ringlets seem'd a Sybarite's,
 Well fitted for the odours strong and strange,
 And for the colours varying, where the bay
 Was mingled with the dark anemone ;
 And where the birch and deadly night-shade mix'd
 Their leaves incongruous with the lily pale,
 And humble violet, that tranquil hangs
 Its dewy head in shade. But not in vain
 Has time upon thy godlike countenance
 Diffused its chasten'd and more tranquil tints ;
 And not in vain has given thy raven locks
 Some hues of wisdom in their silver light,
 Such as full well may suit and harmonize
 Not with the fragrant unguents of the south,
 Nor the rich roses, or the leafy myrtle,
 Which pleasure's sons upon their brows assume,
 But rather with the darker laurel crown,
 In which some purple amaranths are twined,
 The flowers and leaves of immortality,
 Which may prepare thee for immortal palms
 And Christian songs of triumph !"

" ON THE DEATH OF LORD BYRON.

" COMPOSED AT WESTHILL IN THE GREAT STORM, 1824.*

" Gone is the bard, who, like a powerful spirit,
 A beautiful and fallen child of light,
 Of fiery seraph the aspiring peer,
 Seemed fitted by his nature to inherit
 A wilder state than in the genial strife
 Of mighty elements is given our sphere,
 Fix'd in a stated round its course to run,
 A chained slave, around the master sun !

* It was during a storm that he expired. Mr. Gordon, in his admirable History of the Greek Revolution, records it. " At six o'clock in the afternoon of Easter Monday (April 19.), at the instant of an awful thunderstorm, Byron expired."

" Of some great comet he might well have been
The habitant, that thro' the mighty space
Of kindling ether rolls ; now visiting
Our glorious sun, by wondering myriads seen
Of planetary beings ; then in race
Vying with light in swiftness, like a king
Of void and chaos, rising up on high
Above the stars in awful majesty.

" Now passing near those high and bless'd abodes,
Where beings of a nobler nature move
In fields of purest light, where brightest rays
Of glory shine — in power allied to gods,
Whose minds in hope and in fruition prove
That unconsuming and ethereal blaze
Flowing from, returning to, Eternal Love.

" And such may be his fate ! And if to bring
His memory back, an earthly type were given,
And I possess'd the artist's powerful hand,
A genius with an eagle's powerful wing
Should press the earth recumbent, looking on heaven
With wistful eye ; a broken lamp should stand
Beside him, on the ground its naphtha flowing
In the bright flame, o'er earthly ashes glowing."

I shall close this chapter with a copy of verses written in the beginning of this year, when on a visit to a noble family, on whom praise might be lavished, free from adulation, and whose kind attentions were almost the last he received, and warmly felt, towards the close of his career : —

" ASHBURNHAM PLACE.

" January 22. 1823.

" Is this a time for minstrelsy,
When nature rests in deathlike sleep,
And roots, and buds, and herbage lie
Embalm'd in icy cerements deep ?

" When scarce a stream is heard to flow,
And scarce the distant woods appear,
So widely spreads the drifted snow,
The mantle of the newborn year ?

- " When the wild songsters of the grove
Shivering around the mansion fly,
Without a single note of love,—
Is this a time for minstrelsy ?
- " It is a time for minstrelsy !
For still the laurel blooms around,
And bay ; and Fancy's dreaming eye
Can see through mists the fairy ground.
- " And hill, and dale, and woodlands green,
And lakes, which pastoral meads surround,
The distant ocean, and a scene
At home where blossoms rise around.
- " And nature gains from art new powers,
Charms that in happy union meet,
Where wild and cultivated flowers
Together blend their odours sweet.
- " It is a time for minstrelsy !
For round these walls what magic forms
Appear in grace and harmony !
The pencil of the artist warms
- " The coldest scenes, and powers sublime,
Awakening moral forms of things,
And new creations, steal from Time
His scythe, and close his wings.
- " It is an hour for minstrelsy !
For social converse wakes the mind
To pure and happy sympathy ;
And elegance and taste refined
- " Call to the hospitable board
The force of reason and the flow
Of memory, with wisdom stored,
Which might awake a grateful glow
- " In Fancy e'en, tho' check'd by age ;
Make sunshine in the darkest day,
And kindle in the coldest sage
Some strain of vocal minstrelsy."

CHAPTER V.

RESEARCHES ON THE CORROSION OF THE COPPER SHEATHING OF SHIPS, AND ON ITS PREVENTION. — HIS LAST BAKERIAN LECTURE "ON THE RELATION OF ELECTRICAL AND CHEMICAL CHANGES." — JOURNAL OF AN EXCURSION TO NORWAY AND SWEDEN. — VERSES WRITTEN AT COPENHAGEN. — NOTICES OF BERZELIUS, OERSTED, GAUSS, SCHUMACHER. — VERSES WRITTEN AT ULSWATER. — LETTER TO HIS SISTER. — PARALYTIC ATTACK. — NOTICES OF A JOURNEY THROUGH FRANCE INTO ITALY. — VERSES WRITTEN AT RAVENNA.

WE are now approaching the last term of my brother's scientific labours, in which he was occupied, with little interruption, from the latter end of 1823 till the summer of 1826. During the short period of about two years and a half, he communicated to the Royal Society the four following papers: —

"On the Corrosion of Copper Sheeting by Sea Water, and on the Methods of preventing this Effect; and on their Application to Ships of War and other Ships."

"Additional Experiments and Observations on the Application of Electrical Combinations to the Preservation of Copper Sheathing of Ships, and to other Purposes."

"Further Researches on the Preservation of Metals by Electro-Chemical Means."

The Bakerian Lecture for 1826 — "On the Relation of Electrical and Chemical Changes."

These papers, like those on fire-damp, offer a happy instance of an inquiry instituted in quest of a remedy

for a practical evil, after having accomplished the specific object for which it was commenced, leading to other collateral researches, extending the boundaries of physical science, and, applied to the arts, conferring additional and unexpected benefits.

My brother's attention was called to the corrosion of copper sheeting in sea water by the Commissioners of the Navy, to whom, on account of the vast loss in consequence of it resulting to the country, it had become a matter of serious consideration.

Without loss of time he entered on the experimental investigation of the problem.

He first ascertained that there is no constant relation between the impurity of copper and the facility of being acted on or corroded by sea water, which was at that time, and is indeed still, a popular notion; the contrary rather appeared to be the case: in some instances the purest specimens suffered more than those containing alloy.

He next examined into the minute circumstances of the action of sea water on copper. He ascertained that the corrosion of the metal is owing to the joint action of air in the water, and of its saline ingredients; oxide of copper being first formed, and that becoming an insoluble submuriate, and magnesia being at the same time precipitated.

Reasoning on these changes, and the elements concerned in them, in quest of remedial means, he had recourse to electro-chemical science, and the principles which he himself had established of the apparent identity of electrical and chemical attraction, and the power of controuling the one by the other. It occurred to him, that as copper is only feebly positive in the electro-chemical scale, and that as, according

to his ideas, it could only act upon salt water when in a positive state, could it be rendered slightly negative the corroding action of sea water upon it would be null; and whatever might be the difference of the kinds of copper sheeting, and their electrical action upon each other, still every effect of chemical action must be prevented, if the whole surface were rendered negative. But how was this to be effected? Reflecting for some time on the slow and weak action of sea water on copper, and the small difference which must exist between their electrical powers, and knowing that a very feeble chemical action would be destroyed by a very feeble electrical force, he began his experiments of prevention with an extreme case of plunging into salt water acidulated by sulphuric acid a polished plate of copper to which a piece of tin was soldered equal to about one-twentieth of the surface of the copper. Examined after three days the copper was perfectly clean, whilst the tin was much corroded; no blueness appeared in the liquid; though in a comparative experiment, when *copper alone* and the same fluid mixture were used, there was a considerable corrosion of the copper, and a distinct blue tint in the liquid.

This was a fundamental experiment, and decisive of the justness of the views he had formed, and almost decisive of the efficacy of the preventative means he contemplated. "If (he immediately remarks) one-twentieth part of the surface of tin prevented the action of sea water, rendered slightly acidulous by sulphuric acid, I had no doubt that a much smaller quantity would render the action of sea water, which depended only on the loosely attached oxygen of common air, perfectly null; and on trying ~~the~~ part

of tin, I found the effect of its preventing the corrosion of the copper perfectly decisive."

Exemplifying the happy and wonderful success of this simple means, I shall extract a few more details from his first paper, which can hardly fail to excite the interest even of readers who have not devoted their attention to matters of science, and are but little acquainted with the mysteries it discloses.

"In pursuing these researches, and applying them to every possible form and connection of sheet copper, the results were of the most satisfactory kind. A piece of zinc as large as a pea, or the point of a small iron nail, was found fully adequate to preserve forty or fifty square inches of copper; and this wherever it was placed, whether at the top, bottom, or in the middle of the sheet of copper, and whether the copper was straight, or bent, or made into coils. And where the connection between different pieces of copper was completed by wires, or thin filaments of the fortieth or fiftieth of an inch in diameter, the effect was the same,—every side, every surface, every particle of the copper remained bright, whilst the iron or the zinc was slowly corroded.

"A piece of thick sheet copper, containing on both sides about sixty square inches, was cut in such a manner as to form seven divisions, connected only by the smallest filaments that could be left, and a mass of zinc of the fifth of an inch in diameter was soldered to the upper division. The whole was plunged under sea water; the copper remained perfectly polished. The same experiment was made with iron; and now, after a lapse of a month, in both instances, the copper is as bright as when it was first introduced, whilst similar pieces of copper unde-

fended, in the same sea water, have undergone considerable corrosion, and produced a large quantity of green deposit in the bottom of the vessel.

“ A piece of iron nail about an inch long was fastened by a piece of copper wire nearly a foot long to a mass of sheet copper containing about forty square inches, and the whole plunged below the surface of sea water. It was found, after a week, that the copper was defended by the iron in the same manner as if it had been in immediate contact.

“ A small piece of zinc was fastened to the top of a plate of polished copper, and a piece of iron of a much larger size was soldered to the bottom, and the combination placed in sea water. Not only was the copper preserved on both sides, in the same manner as in the other experiments, but even the iron ; and after a fortnight, both the polish of copper and the iron remained unimpaired.”

His discovery, the result of these researches, he thus announced to me, in a letter written just after his first paper was read, and when not even a shadow of doubt appears to have crossed his mind of any possible failure in its application to the grand object of naval economy, for which the inquiry was instituted, and when he indulged, in consequence, in most sanguine expectation of perfect success :—

“ Fife, Jan. 30. 1824.

“ MY DEAR JOHN,

* * * * *

“ I have lately made a discovery of which you will for many reasons be glad. I have found a complete method of preserving the copper sheeting of ships, which now readily corrodes. It is by rendering it

negatively electrical. My results are of the most beautiful and unequivocal kind; a mass of tin renders a surface of copper 200 or 300 times its own size sufficiently electrical to have no action on sea water.

"I was led to this discovery by principle, as you will easily imagine; and the saving to government and the country by it will be immense. I am going to apply it immediately to the navy. I might have made an immense fortune by a patent for this discovery, but I have given it to my country; for in every thing connected with interest, I am resolved to live and die at least '*sans tâche*.'

* * * * *

"I am, my dear John, very sincerely,

"Your affectionate Friend and Brother,

"H. DAVY."

In his second paper, which followed the first after an interval of five months, he relates the results of the experiments then in progress, on the protection of copper sheeting by his method in our naval establishments at Chatham and Portsmouth, applied to the bottoms of boats and vessels at rest. Up to that time his expectations had been fully answered; indeed, he says, the influence of the protectors (as the more oxidable metals attached were called) in many instances even surpassed his expectations.

"When the metallic protector was from $\frac{1}{4}$ to $\frac{1}{10}$, there was no corrosion nor decay of the copper; with smaller quantities, such as from $\frac{1}{10}$ to $\frac{1}{40}$, the copper underwent a loss of weight, which was greater in proportion as the protector was smaller; and as a proof of the universality of the principle, it was found that

even $\frac{1}{1000}$ part of cast iron saved a certain proportion of the copper."

In some instances, as he had anticipated, there was a deposition of carbonate of lime and magnesia on the copper, followed, contrary to his anticipations, by the adhesion of sea insects and weeds. This happened when the copper was protected by a larger proportion than usual of zinc or iron; it did not occur when they were in a proportion less than $\frac{1}{100}$; when "the electrical power of the copper being less negative, more neutralised, and nearly in equilibrio with that of the menstruum," its decomposing effect as part of a voltaic combination was less; no earthy matter was deposited, and no weeds or insects adhered; and the surface, though it had undergone a slight degree of solution, remained perfectly clean; "a circumstance (he observes) of great importance, as it points out the *limits of protection*, and makes the application of a *very small* quantity of the oxidable metal more advantageous in fact than that of a larger one."

In his third paper, communicated a year after the preceding, he continued the inquiry, in connection with the result last mentioned, the knowledge of which had rendered the application of protecting means more difficult than was at first expected.

He renewed the investigation by carefully examining the circumstances of copper sheathing exposed to the action of salt water without artificial protection.

He found that the copper sheathing remained clean so long as the wear of its surface was equal and uninterrupted; its freedom from weeds and shells being owing, not to any poisonous quality of the copper, but to a loss of substance by solution and scaling off, preventing their adhesion.

He next determined that when the copper sheathing becomes foul (as it occasionally does, though unprotected), the effect is commonly connected with two distinct operations simultaneously going on,—a formation of rust, which serves as a soil or bed for sea weeds and insects; and unusual corrosion at a little distance. “In general (he observes), in ships in the navy, the first effect of the adhesion of weeds is perceived upon the heads of the mixed metal nails, which consist of copper alloyed by a small quantity of tin. The oxides of tin and copper which form upon the head of the nail, and in the space round it, defend the metal from the action of sea water; and being negative with respect to it, a stronger corroding effect is produced in its immediate vicinity, so that the copper is often worn into deep and irregular cavities in these parts.”

These cases, I may remark, are strongly contrasted with those in which protectors were employed; in the latter, if the bottom became foul, it was in consequence of being generally defended from corrosion; or if it remained clean, as when the oxidating metal was applied in accordance with the due protecting limit, the wear of the surface was of the most moderate and uniform kind, only just sufficient to prevent adhesion.

In the former papers the experiments detailed were made on vessels in harbour; in this paper he gives the results of some analogous trials, carried on during a voyage which he made the preceding summer in a steam-boat in the North Seas. They proved two things; first, that protectors are equally efficient attached to a ship in motion as in a state of rest; and secondly, “that independently of the

chemical, there is a mechanical wear of the copper in sailing, and which on the most exposed parts of the ship, and in the most rapid course, bears a relation to it of nearly 2 to 4.55."

He next relates a series of experiments to ascertain the extent of the diminution of electrical action in instances of imperfect or irregular conducting surfaces, which he was led to institute from observing that in some cases, when protectors had been applied to copper sheathing, the joinings of which were old, tarnish or corrosion appeared, which seemed to increase with the distance from the protecting metal.

The results he obtained indicated, —

First, that when a perfect metallic connection exists, there is no apparent diminution of conducting power, or preservative effect, however divided or diffused the surface of the copper may be; and secondly, that when the connection is by an imperfect fluid conductor, a very small quantity of this conductor is sufficient to transmit the electrical power and complete the chain.

This last result induced him to try if copper nailed upon wood, and protected merely by zinc or iron on the under surface, or that next the wood, would not be defended from corrosion. "For this purpose (he says) I covered a piece of wood with small sheets of copper, a nail of zinc of about the $\frac{1}{100}$ part of the surface of the copper being previously driven into the wood; the apparatus was plunged in a large jar of sea-water; it remained perfectly bright for many weeks; and when examined, it was found that the zinc had only suffered partial corrosion, that the wood was moist, and that on the interior of the copper there was a considerable portion of revived zinc; so

that the negative electricity by its operation provided materials for its future and constant excitement. In several trials of the same kind iron was used with the same results; and in all these experiments there appeared to be this peculiarity in the appearance of the copper, that unless the protecting metal below was in a very large mass, there were no depositions of calcareous or magnesian earths upon the metal; it was clean and bright, and never coated."

"These results (he continues) upon perfect and imperfect conductors led to another inquiry, important as it relates to the practical application of the principle; namely, as to the extent and nature of the contact or relation between the copper and the preserving metal. I could not produce any protecting action of zinc or iron upon copper, through the thinnest stratum of air, or the finest leaf of mica, or of dry paper; but the action of the metals did not seem to be much impaired by the ordinary coating of oxide or rust; nor was it destroyed when the finest bibulous or silver paper, as it is commonly called, was between them, moistened with sea-water. I made an experiment with different folds of this paper. Pieces of copper were covered with one, two, three, four, five, and six folds; and over them were placed pieces of zinc, which were fastened closely to them by thread; each piece of copper so protected was exposed in a vessel of sea water, so that the folds of paper were all moist.

"It was found in the case in which a single leaf of paper was between the zinc and the copper, there was no corrosion of the copper; in the case in which there were two leaves, there was a very slight effect; with three the corrosion was distinct; and it in-

creased till with the six folds the protecting power appeared to be lost ; and in the case of the single leaf, there was this difference from the result of immediate contact, that there was no deposition of earthy matter : showing that there was no absolute minute contact of the metals through the moist paper, which was likewise proved by other experiments ; for a thin plate of mica, as I have just mentioned, entirely destroyed the protecting effect of zinc ; and yet when a hole was made in it, so as to admit a very thin layer of moisture between the zinc and the copper, the corrosion of the copper, though not destroyed, was considerably diminished."

With a view to the same practical application of the principle, the following experiment was made : — " A small piece of iron was placed in one glass, filled with a saturated solution of brine, which contains little or no air ; copper attached by a wire to the iron was placed in a vessel containing sea water, which was connected with the brine by moistened tow ; the copper did not corrode, and yet the iron was scarcely sensibly acted upon, and that only at the surface of the brine ; and a much less effect was produced on it in many weeks than would have been occasioned by sea water in as many days : " a very important result, and which was confirmed by others, showing that protection may be afforded of a very efficient kind, almost to the exclusion of chemical action ; or that there is no necessary connection between the degree of protection and the quantity of waste of the protecting metal.

From the principles of protection, after having given many instances of ships which had returned from long voyages with their copper sheathing pre-

served in a very remarkable manner, he proceeds to point out, in conclusion, what he considers the most effectual method of employing protectors : —

“ In cases when ships are to be newly sheathed, the experiments which have been detailed in the preceding pages render it likely that the most advantageous way of applying protection will be under, and not over the copper, the electrical circuit being made in the sea water, passing through the places of junction in the sheets ; and in this way every sheet of copper may be provided with nails of iron or zinc for protecting them to any extent required. By driving the nail into the wood, through paper wetted with brine *above*, the tarred paper, or felt, or any other substance that may be employed, the incipient action will be diminished ; and there is this great advantage, that a considerable part of the metal will, if the protectors are placed in the centre of the sheet, be deposited, and re-dissolved ; so there is reason to believe that small masses of metal will act for a great length of time. Zinc, in consequence of its forming little or no insoluble compound in brine or sea water, will be preferable to iron for this purpose ; and whether this metal or iron be used, the waste will be much less than if the metal was exposed on the outside, and all difficulties with respect to a proper situation in this last case are avoided.

“ The copper used for sheathing should be the purest that can be obtained * ; and in being applied to the ship, its surface should be preserved as smooth

* He considered the presence of alloy favourable to the formation of crusts of insoluble oxide, and the adhesion of weeds and shell-fish, and irregular corrosion.

and equable as possible; and the nails used for fastening should likewise be of pure copper, and a little difference in their thickness and shape will easily compensate for their want of hardness.

“ In vessels employed for steam navigation the protecting metal can scarcely be in excess, as the rapid motion of these ships prevents the chance of any adhesions, and the wear of the copper, by proper protection, is diminished more than two thirds.”

As the principles of electro-chemistry which he developed in his first Bakerian Lecture, that of 1806, led to the discovery of a means of protection for copper sheathing, so the researches which this inquiry gave rise to brought him back to the investigation of electro-chemical action. This was the subject of his last Bakerian Lecture, which he gave the year following the date of the preceding paper, namely, in 1826. It consists of eight parts : —

“ I. Introduction.

“ II. Some Historical Details.

“ III. On the Modes adopted for detecting the Electrical States of Bodies and Definitions of Terms.

“ IV. On the Electrical and Chemical Effects exhibited by Combinations containing single Metals and one Fluid.

“ V. Of Electrical Combinations consisting of two imperfect and one perfect Conductor, or two Fluids and a Metal or Charcoal.

“ VI. Of Combinations consisting of two Conductors of the more perfect Class and one Fluid.

“ VII. On the Accumulation of Electricity, and the Chemical Changes it occasions in Voltaic Arrangements.

“VIII. General Observations and Practical Applications.”

In the introduction he expresses the great satisfaction he has in the idea, that after a number of new experiments which he himself had made, and notwithstanding the various novel views which had been brought forward, and the great activity and extension of science, he had nothing to alter in the fundamental theory, which he laid down in his Bakerian Lecture of 1806; and which, after a lapse of twenty years, was still, as in the beginning, the guide and foundation of all his researches.

The historical details, which he felt himself under the necessity of giving in vindication of rights which had been encroached and broken in upon with as little delicacy as justice, have already been brought forward when considering his early electro-chemical labours.

Of the other parts of this lecture I shall not attempt to give an analysis, — they hardly admit of abridgment; and to be understood, and duly appreciated, they require to be carefully studied in the original. The concluding “General Observations and Practical Applications,” however, may in part be excepted, in which he reverts to the subject of the protection of metals by electro-chemical means; notices the general result of his extended experience, the disappointment of his first sanguine hopes, and the degree of hope in which he considered himself warranted in indulging, founded on his later researches.

“A great variety of experiments (he says), made in different parts of the world, have proved the full

efficacy of the electro-chemical means of preserving metals, particularly the copper sheathing of ships; but a hope I had once indulged, that the peculiar electrical state would prevent the adhesion of weeds or insects, has not been realised. Protected ships have often, indeed, returned, after long voyages, perfectly bright, and cleaner than unprotected ships; yet this is not always the case; and though the *whole* of the copper may be preserved from chemical solution in steam vessels by these means, yet they must be adopted in common ships only so as to preserve a portion,—so applied as to suffer a certain solution of the copper; and an absolute remedy for adhesions is to be sought for by other more refined means of protection, and which appear to be indicated by these researches.”

It may not be amiss to subjoin an instance or two of the successful application of the protectors above alluded to, which are described in his third paper. One of the most remarkable instances was the *Carnebrea Castle*, a large vessel upwards of 650 tons, furnished with four protectors, two on the stern and two on the bow, equal together to about $\frac{1}{16}$ of the surface of the copper. She had been protected more than twelve months, and had made the voyage to *Calcutta* and back. She came into the river perfectly bright, and when examined in the dry dock was found entirely free from any adhesion, and offered a beautiful and almost polished surface; and there seemed to be no greater wear of copper than could be accounted for from mechanical causes. The *Dorothy* was another remarkable instance of the advantage of protectors. Her copper sheathing was much worn, so that it was doubtful if she would be able to

make another voyage to India without being re-coppered. In this state protectors of τ were applied to her, and she effected the voyage without any apparent wear of her sheathing. More examples to the same effect are adduced, but it is not necessary to repeat them.

The principle of protection was perfect ; in that he had experienced no disappointment. The only difficulty was how to prevent the adhesion of sea weeds and shell-fish. Remedial means he suggested, as has been mentioned, for this purpose, founded on experiments made in the laboratory, but which, I believe, he never had an opportunity of trying on a large scale. The experiments in the navy were the least successful of all. I apprehend that they were carelessly made, and certainly they were very soon relinquished. Had they been carried on by persons sincerely interested in them, who can doubt that their termination would have been successful ? who can doubt but that some simple means would have been discovered by which, whilst the copper was fully protected from corrosion, it might be kept clean by a mechanical process, which in a ship of war, with so many hands at command, would have been of easy application ? One instance, and one only, has come to my knowledge, in which an attempt of this kind was made by an officer of more than usual intelligence and activity. It occurred in the Madagascar frigate, on the Mediterranean station. She was provided with protectors ; and in consequence of the preservation of her copper, her sheathing became foul, so as to impede her sailing. In a very short time, I have been informed, without entering port, by applying some very simple method of cleaning, the adhering weeds, &c. were

removed, and she immediately recovered her usual speed. Were the same attention given to the bottom of a ship that there is to the high order of her decks, or only a small portion of that attention, it seems, from this example, highly probable that foulness from adhesion might be entirely prevented, the protectors rendered perfectly efficient, and an immense saving of expense effected.

No sooner was the beautiful principle of metallic protection discovered, than various economical applications of it were obvious, for the purpose of preserving iron, steel, tin, brass, and other useful metals, both in delicate instruments, in powerful machinery, and in great constructions designed for permanency. "Whenever a principle or discovery," he remarks, in concluding his last Bakerian Lecture, "involves or unfolds a law of nature, its applications are almost inexhaustible; and however abstracted it may appear, it is sooner or later employed for the common purposes of the arts and the common uses of life." It was this conviction of extensive and increasing usefulness of his discovery, and the persuasion that it would be duly appreciated by posterity, which constituted his reward for his toils in the inquiry, and more than compensated for the apparent ingratitude of his contemporaries, and, after the first irritation had subsided, made him regardless of the slanders and false reports which were invented and circulated at the time by ill-designing and malicious persons.

I shall now recur to the narrative of the incidents of my brother's life.

In the account just given of his researches on the protection of copper sheathing, a voyage which he made in the North Sea in the summer of 1824, for

the purpose of trying the influence of motion on the protectors, is mentioned. On his return, he wrote the following note to my mother, descriptive of his course : —

“ London, August 22. 1824,

“ MY DEAR MOTHER,

“ I returned on Tuesday from some extensive travels and voyages of more than two thousand miles, having gone round the coast of Norway, and through Sweden, Denmark, Holstein, and Hanover. I went sometimes in the Admiralty steam boat, which was at my disposal, and sometimes by land.

“ I have done a great deal in seven weeks, having made some important philosophical observations, spent some days in the capitals of the north, and passed the North Sea twice ; once in a storm, in which the steam vessel had to go against wind and tide.

“ I have been successful in all my objects, one of which is important to the navy.

“ Whilst I was in the north, John was sailing south. I have a letter from him of the 17th June. He was well, and just going from Malta to Greece. I am not sure whether I shall go to Scotland or to the north of England ; but I shall leave town immediately. Lady Davy is making a tour in Switzerland, and is quite well.

“ With kindest love to my sisters,

“ I am, my dear Mother,

“ Your affectionate Son,

“ H. DAVY.”

He had for a long time discontinued keeping a diary when travelling. Of this excursion, however,

he wrote an account, the greater part of which I shall lay before the reader. It thus opens at Gottenburgh, when confined by indisposition to the solitude of his chamber : —

“ Gottenburgh, July 21. 1824.

“ Is the melancholy and the debility produced by sickness favourable to intellectual exertion? I believe so. The mind necessarily becomes contemplative when the body is no longer active, and the empire of sensation yields to that of imagination. Under such circumstances, likewise, the mind is sober, and disposed to discover realities, and values quiet and comfort more than pomp and éclat. During the last fortnight I have seen and felt some novelties; yet but for the wretched state of body in which I am, they probably would never have been committed to paper.

“ I left London on the 30th June: Lady M. would say, ‘on the wings of hope, aided by the paddles of steam.’ I had never before seen the whole of the river, or known the immensity of British capital, industry, and activity displayed by the great inlet to the most wonderful city in the world.

“ We left Greenwich at two o’clock, and before nine we were coasting the Suffolk low lands, and lost sight of land before it was dark. A favourable wind and steam enabled us to see the coast of Holland next day at three; and before the evening we had passed the Texel, and the sand hills north of the Texel, and were in the apparently unbounded ocean, and saw the sun set in clouds, which looked as the promise of another fair day. In the morning we were called up on deck to see Heligoland appearing, — an abrupt rock capped by a light-house, scarcely distinct

in consequence of the dark sea and sky. The rain poured in torrents; and through the delay of shifting, and the slowness of pilots, we did not land till twelve, when I found the use of my water-proof cloak and boots. There can scarcely be said to be a harbour round this rude island, but of course there is shelter from all winds; and we anchored within a gunshot of the town (one eighth of a mile). The houses are constructed of wood, and in general low and confined. The population seems miserable; but all the articles of life very cheap, particularly bad wine and spirits, madeira and brandy being sold for a shilling a bottle, and other spirits and cordials proportionally cheap. The island is about a mile long, and principally covered with potatoes. The rocks which everywhere surround it, except on the south side, are peculiarly crumbling greywacke stone in a constant state of decomposition. The highest points of the cliff appeared to me to approach 400 or 500 feet. No wheat is grown, but a little barley. The island has ceased to be the deposit of English goods, and is now miserably poor. The language high German; the women fair, but not handsome; very little dark hair; flaxen locks and blue eyes form the character of both men and women; and, as the women labour hard, their forms are neither good nor graceful. Next day, 3d July, we dined with the governor, and by the evening were completely tired of the island. At six we sailed, with rather a rougher gale than was pleasant; the gale increased, and the ship rolled. About two, a thunder storm came on; and, to the relief both of my mind from anxiety and my stomach from sickness, the rain stilled the waters. About twelve next day the weather was agreeable, and the sea tolerably calm. We were on

the North Sea. About two the weather changed; a breeze came on, which strengthened into a gale. Towards night the ship rolled considerably; the water dashed over the decks, and the vaunted power of steam over the elements was as nothing: yet the steam carried us on, though slowly; and after much labouring and some danger, and much dripping, and one death, that of an unfortunate painter, we made the coast of Norway at seven in the morning,—my experiments ruined, and misfortune to aggravate the misery of sickness. I did not get out of bed till we were fairly lodged in port at Rleve; for even the desire of seeing a new country for some time did not reanimate me to any exertion, so strong had been the tossing of the wave.

We had gone to bed in sickness, storm, and darkness: in getting upon deck, what a contrast! All was calm, beauty, and repose. We were in the bosom of a basin rather than a bay; the water like a mirror, beautifully green, and myriads of medusæ of the most beautiful colours, like animated flowers, moving about us, some of them nearly eighteen inches in diameter, and having antennæ several feet in length. Above our heads was a bright blue sky, seen through a kind of telescope of high rocks covered with wood, the wood of England—oak, birch, alder, and some few pines, and wild roses, and woodbines. The steamboat was so close to the rocks that we landed on them by a board, and it was a matter of wonder where she could have made her entry; rocks rose every where around us. The rocks were granite, modelled by the rude and primitive hand of nature,—rude and primitive, as far as these elder foundations of our globe are considered.

We soon landed, and walked over granite rocks to the town of Mandels, which is on the other side of a fine river. The idea of salmon-fishing reanimated us ; and I soon hired a boat, and we passed up the river. The town of Mandels is built entirely of wood, and seemed to contain very few respectable houses. The inn was uncomfortable enough. Such beds ! hardly big enough. The rooms without plaister or paper, displaying the moss and the *cut trees* (pines) of which the whole was built. Some of the women were tolerably well-looking ; both men and women very civil, probably without the means of being hospitable. The scenery about the river very peculiar. Rocks rising like islands out of the sand, or really islands in the sea, from 100 to 600 feet high, and covered with wood ; and so numerous and so various in their forms, colour, and distribution of masses, as to be very beautiful. The river was of the size of the Tweed before it joins the Tiviot, and had the reputation of affording the best salmon in Norway. We rowed against the stream, the scenery constantly becoming more beautiful. The woods came down to the water's edge. There were some cliffs, but no precipitous ones. The banks were green slopes, with the wood peculiar to England and most of the flowers, and beautiful meadows close to the water, which was very transparent, with a hue in which amber predominated, but not peaty. The outline was generally formed by rocks, some of which in the distance were covered by pines. I threw the fly in vain for an hour, and then let it trail behind the boat, when two or three unlucky trout were taken, which were like the English small trout. We were resolved to procure a salmon for our dinner, and waited till a net was drawn ;

when several were caught, one of which must have weighed twenty pounds. I purchased one about nine pounds for two shillings. We continued till we were stopped by a rapid, where the rocks came down close to the river, and where the scenery was more wild and upon a greater scale. Here we left the boat, and walked about a mile, to the fall of the Mandels river, which is rather a rapid than a fall, — a succession of foaming stream and pool, where the water leaps from rock to rock, from four to ten feet, and over which salmon easily make their way. The narrow channel through which the river runs is very picturesque, and the birch trees grow close to the fall, as if out of the granite rock. The sun was bright, yet I thought myself sure of a salmon; but my skill was vain. I saw two or three rise, and one, I believe, at my fly; but neither this day nor the evening had I any success. Next day, Lord Clifton* and I went to a salt-water lake or pond, where we caught four sea-trout, very good and red, with artificial flies; they rise very freely. Here the scenery was exquisitely beautiful; a succession of arms of the sea all like inland lakes, full of granite islands, and surrounded by high hills covered with the richest kind of vegetation; the rose, the woodbine, the cornel tree, and all our English flowers, and mountain ash, and birch, and oak, in profusion. Every moment we opened on a new scene as we passed by in our boat. We asked if there was no fresh water near, looking for a stream in which we might fish. They carried us to a spot, where evidently a torrent sometimes passed, and in less than twenty yards we found ourselves on the rocky brink of an inland fresh

* Late Earl of Darnley.

water lake, as beautiful as the upper lake of Killarney, and something like it. Here we fished without success; but we were recompensed by the agreeable nature of the scenery, which was exquisitely beautiful. In addition to the other clothing of the rock, heath, juniper, the blae-berry, were found here in abundance, and the lake was full at the borders of the most beautiful water lilies. In this lake, the boatmen informed me, char was found; at least from their description it must have been this fish.

“I was told of a fall on a river about six miles to the west. I mounted a Norwegian pony, and went with the son of the innkeeper. This journey the scenery was beautiful throughout the ride. Two fine fresh water lakes came in view, with many wooded islands; the granite rocks assumed more the character of mountains, and finewoods clothed their tops. The road was rugged, and accessible only for horses and the wretched little cars of the country, something like those of Naples, and which, upon these rocky paths, must be painfully jolting. The vallies for five miles were narrow, and the scenery, lake and rock, covered with wood. We passed a mountain torrent, beautifully banked and wooded, where I saw a number of small trout. After we had attained the summit of the second mountain, we saw a deep pastoral valley at the termination of a lake below; and after mounting a second hill more cultivated than any we had passed, came to the river, which rolled through a broad valley bounded by cliffs of granite, with pine-covered hills beyond. The river was full of green weeds; I saw a few trout in it, but no salmon. The scenery was very beautiful all the way to the fall, which was not very fine. A small body of water fell perhaps thirty or forty feet; but all the rocks around

the fall were disfigured by saw mills, and the water covered with deals, and hills of saw-dust close to the banks of the river.

“ After spending four days at Mandels we left it in the steam boat for Christiansand. We had a little rough sea in going out of the port; afterwards a delightful voyage between rocks and islands, some bare and some wooded, and through channels sometimes not so wide as our vessel was long, and in perfect calmness. Here we saw the first sea eagle, and many birds which appeared eider ducks, and other water-fowl. We arrived in four hours at Christiansand. Here we met with great hospitality, dining out every day; the first day with the Consul of the Hanseatic Towns; the second, with the British Vice-Consul. Count Reinhard, the Hanseatic Consul, took me to see the Torjedale, which empties itself into the harbour of Christiansand. The harbour itself is a very fine one, with the peculiar Norwegian features of rocky islands, high granite crags more or less covered with trees, and promontories generally topped with firs. The quantity of firs was greater on this coast than at Mandels, and the valley of the Torjedale displayed more fir wood than wood of any other kind; yet, occasionally birch, alder, and oak appeared on the banks, and birch was not uncommon. The glen leading to the Torjedale was narrower, but the rocks on a grander scale than anything we had yet seen. The river itself, a fine majestic stream, as large as the Rhone at Lyons, of a fine green colour and perfectly transparent, presenting every where along its banks the unpicturesque riches of Norway, — the white stripped and trimmed floating forests. From a point of rock near Mr. Reinhard’s country

house, I saw a salmon leap in the river, just below one of those great chains of fir which are placed to arrest the wood floated down from the mountains in the interior. The dinner at Mr. Reinhard's was plentiful, but a mixture of German and English, without the kipper salmon and spirits. Toasts were given, and wine drank with moderation,—Bordeaux and excellent hock of 1811, and excellent Madeira; with cherries, and strawberries, and green peas. Mr. Mark, the English Vice-Consul, invited us to dinner next day,—to dine and go first to the waterfall, where he promised I should catch a salmon by hook or by crook. We went off at nine o'clock, and took boat at four miles from Christiansand, and by the help of four oars went up the river, the banks of which are of the same character as those I had already seen,—rude rock, hills covered with oak, birch, and alder, cliffs with pines above, and a variety of pool and stream. At half a mile from the fall, the scenery became wilder, and we were obliged to walk. We went to a country house of the Consul's, and found there excellent refreshments; kipper salmon, cheese, and Hamburgh sausages, with white and red Bordeaux. We soon came in sight of the fall, a magnificent rush of water, no where perpendicular, yet making a grand display of one of the great *machines* of nature. I should rate the succession of descents (two being principal) at 120 or 130 feet, and there are many rapids below. It is disfigured by saw-mills, and, in my opinion, by the rushing down and constant appearance of the floating wood; yet it was a grand sight; and the fir woods upon the surrounding hills, and the island which divides the river into two parts, and the immense extent of rapid, all white.

upon green, had a very fine effect. No salmon rise above this fall, which, in point of quantity of water, I think surpasses that of the Rhine at Schaffhausen; but is inferior to it in perpendicularity and in picturesque accompaniments. We returned to dinner at Mr. Mark's, where we again found kipper salmon, anchovies, brown bread and butter, and various liqueurs. This was the prelude to the dinner. Our first course was ham, and peas boiled with sugar in their shells; then some salmon boiled; then chickens roasted, with abundance of parsley in their bellies; then roast veal; and last of all cranberry jelly, most delicious, with cakes and sweet things. We had plenty of fruit upon the table before dinner, which seemed as the garnish, and both here and at Mr. Reinhard's salad with cheese after dinner; the salad being very good, particularly the cucumbers, which had been prepared by being kept some time in salt, and then washed, which makes them tender, and abstracts their unwholesome juice, which separates in large quantities.

“*Two culinary hints : Roast your fowls with plenty of parsley in their bellies; place sliced cucumbers, if you wish them to be wholesome, in salt. Another : eat kippered salmon raw, with pepper, and bread and butter. Bourdeaux, Madeira, and port, were the wines all drank with dinner. Their toasts, their healths, and short speeches, all during dinner. After the cakes and the last toast we all went to coffee, and then home, though the hospitable master of the house offered us supper and bishop; probably wine and water hot.*

“We left Christiansand in the morning at twelve, and at four found ourselves safely moored in the har-

bour of Arendal. We passed generally within the rocks, and had the same kind of scenery as in our voyage from Mandels, — an immense variety of little rocky *islands* constantly opening upon us; and sometimes our passage seemed hardly large enough for the passage of the boat. The harbour of Arendal is very beautiful, and the town most singularly placed upon a rock, with rocks surrounding it, and deep water close to the houses. Trees crown the rocks, and neat little houses come close to the water's edge. I went immediately to a beautiful wooded rock just above the town, where the Mandel scenery appeared as if echoed upon the river of Arendal. I likewise went to visit the iron mines, which are curious in sienite, with all the rare specimens well known to mineralogists. One of the mines presents a very fine excavation, and you look out upon a tranquil little lake, with pastoral and wooded scenery around it. The day after, a row to the fall of the river: not so large as that of the Torjedahl, but with the same features; the banks pastoral, the usual vegetation below, and pines above. Where one branch of the river enters the sea, close to the fresh water, and in what can be scarcely brackish water, myriads of beautiful medusæ were to be seen; but none in the absolutely fresh water. In the afternoon we went to Mr. Tiddi-camp's country seat to a feast, — a dinner where all the neighbourhood was invited; where *cabbage* was the first dish put on the table, after the usual prelude of anchovies, sausages, and spirits. The anchovies excellent. After the cabbage came ham, carved and served, as by a servant-maid, by the young lady of the house, a very pretty girl. After the ham cutlets and peas dressed in the shells, then chickens with

parsley ; then cakes with jelly (gooseberry cake), with plenty of Bourdeaux and Madeira, and toasts during the whole of dinner. When I gave *Liberty, FREYHEIT*, the whole party rose, and sang a song in full chorus. My health was drank, and the Royal Society, and the British Constitution, and the memory of Lord Byron. After dinner we all shook hands, and then walked to see a most magnificent view ; the sea on one side, and wood almost interminable, with lake and mountain on the other, and a thousand little ponds all surrounded with wood. Some mountains, of apparently the elevation of the Grampians, in the back ground, but without snow. We were struck at Arendal by the manner in which the women were treated. The postmaster was rowed to the Vice-Consul's to this grand dinner by a female servant, who was rather good-looking and young, and who dashed through the surge as a Thames boatman would have done, with her great hulking master sitting opposite to her. I was carried across the lake, from the iron mines, by a boat-woman. The ladies *speak* only Norwegian ; but I saw pianofortes, which marked at least the love of music. From the time we landed in Norway till now we have had no night ; the twilight in the west is succeeded by twilight in the east, and at midnight I could read the smallest print. The Norwegian rivers that we have hitherto seen are all beautifully clear, and display their mountain origin and their passage through lakes ; the tendency of colour is to green, but no peatiness ; nor have I yet seen any river with that celestial blue which characterises the Rhone. I caught in the Torjedahl two trout, and a sea trout about the size of a large herring. In the Arendal river I caught

nothing! I am sure the saw-mills and saw-dust must interfere greatly with the fisheries in these magnificent streams.

“ *July.*—We left Arendal at two in the morning, and passed through our usual fine scenery, sometimes almost touching the little islands covered with wood; then branching a few miles into the Northern Ocean, and seeing between us and the shore thousands of islands and rocks. We saw no seals, and the sea-birds were not so numerous as I had expected. The male eider duck we saw in flocks of four or five, flying like a black cock; one sea eagle soared above us; gannets, gulls, sea swallows, and the oyster catcher, were not uncommon. At twelve the next day we anchored in the harbour of Laurvig; more open than any harbour we had yet seen. I examined my experiments, the results of which were very satisfactory, and landed, and examined the zirconite rocks. I saw zincon, I believe, in one specimen. The sienite very fine, with immense crystals of hornblende, and the feldspar having in some places the lustre of the feldspar of Labrador. The arm of the bay of Laurvig wooded even to the sea; a small river as large as the North Esk, in which they say salmon come up late in the year; but the usual disfigurement of mills and iron works close to the town.

“ Having no object for staying at Laurvig, we left it for Frederickstadt at two o'clock; and going rather further from the coast, passed along islands of a larger size, and saw mountains of rather a higher character in the Norwegian land. We crossed the ford of Christiana without ever losing sight of land, and at five found ourselves amongst rocky islands

topped with pines, in the mouth of the Glommen, the largest river in Norway. The masses of granite in these islands are larger, the underwood and flower-bearing wood less, and the whole scenery ruder: the stream rather whitish, but not muddy, flowed rapidly by the rocks; yet we moved more rapidly against it, and soon anchored before Medensfel. The fall of the Glommen being only six English miles off, we requested the captain to ascend the stream to it; and we had a most brilliant evening, dashing through the rapids of this immense river, which, I think, exceeds in size the Danube at Vienna. The banks were beautiful, but not wild,—corn fields, wooded hills, and some rocky cliffs. We anchored at the termination of the rapid, in a rush of whirlpool close to the shore, and passed the night on board. It was amusing to see the wonder of the people, who came out to see this new phenomenon of the steam-boat going against wind and tide, and who, from their exclamations, probably took us for Lapland wizards. A person, who asked us to take him up the river, invited us to his father's house, close to the fall; and in the morning the elder brother and our friend came down to take us up in two carriages. We were soon at the fall; which is a grand rush of water, not perpendicular, but in its descent does not make less than 100 feet of white water. It is the grandest rush of water I ever saw, and after the descent boils and foams for half a mile. Salmon never rise above it. Boats have been sometimes carried down, and dashed with their burdens into pieces. From the top of the fall, where the river is perfectly still, beautifully smooth, and a quarter of a mile at least in breadth, it is a grand sight to see this enormous mass suddenly con-

verted into foam and white wave, dashing with an irresistible shock and a voice like thunder over immense masses of granite. Saw-mills are here likewise, but less offensive from the immense magnitude of the river; and fir trees seen at the bottom are like chips and straws in one of our English rivers.

“ We left the fall of the Glommen at seven in the morning, and at twelve we were at Struenstadt. The coast was wild; we sailed between rocky islands covered with wood, principally pine, but sometimes oak and birch. There was more of grandeur in the outlines, but not the same variety as in Norway; but the same immense masses of granite and the same myriads of islands. The day was dark and stormy, and harmonised well with the scenery.

“ *Sweden.*

“ I had seen very little of the Norwegian inns, but the first specimen of a Swedish inn was far worse than anything I had yet experienced. The inn at Stronstadt was dirty, the beds bad, the fare worse; rye bread and bad butter; the only thing tolerable a cutlet, apparently made of *minced raw meat*. This is a good hint for tenderness, as it does away with one of the great evils of fresh killing. Stronstadt is a small town on granite rocks, with a variety of coast, and its lands of the same character. A lake, containing pike and coarse fish, is emptied by a small river which runs through the town. We got into a boat, and fished for pike with flies. Lord Clifton took a small one. On landing from the lake upon a small promontory, we found abundance of berries in the English state of perfection; cranberries, blae-

berries, raspberries, an unknown black juicy berry, strawberries, and juniper berries. Lord Clifton collected a large quantity for three black game fowls he had bought for a guinea alive and of last year. Here I bought a miserable carriage; and next day began my journey to Gottenburgh, over heath, and a country like Scotland, with abundance of blae-berries growing to an immense size, and very good.

“Nothing could be more dreary than the first twenty miles of this journey; the country like Ireland, or the worst part of Scotland, and generally without wood; a slight cultivation of barley and oats, but for the greater part waste; the post-houses wretched hovels, inhabited by peasants apparently very ill off. We now passed through a large forest of pines, and the country became rather more interesting; but there were no grand pictures. As we approached to Questrin, where I was to dine, the country became richer, and wooded valleys began to break the uniformity of hills and heath. A peaty river, which is said to contain salmon, flows through Questrin; and here the whole valley is very fine, with noble views of inlets of the sea, with the usual character of fiord, rock and wood. The sea broke in upon the view more or less from Questrin to Undeville; and all the country may be regarded as picturesque, and has an air of comfort, and, where cultivated, appeared well cultivated. Undeville is a town close to the sea, the salt water flowing up to the houses, and with a port. I found the inn very bad, at least compared with inns of England or France, but not unreasonable. I do not know that I ever went a more disagreeable journey than that of this day; not understanding the language, I could never

satisfy the peasants, who were rude and coarse; and my Forebode, though it prevented me from waiting for horses, did not secure me civility; and the peasants finding I could not speak Swedish, endeavoured to impose upon me. The weather likewise was stormy, with a bright sun, and a road which was covered with clouds of dust. The travelling is cheap enough; sixteen shillings in the country and twenty in town, each horse, for six English miles. Forty-eight shillings are equal to one-twelfth of the pound sterling; so that each horse costs $6\frac{3}{4}d.$ the Swedish mile, and three horses $1s. 8d.$ British for six miles.

“ Wenersburgh.

“ From Undevelle, next day I pursued my road to Wenersburgh, and found the country improve. There was a good deal of pine wood, with crags of granite, and a succession of small wooded hills, with small peaty streams; the outline of the country was generally made up of great forests of pines. At Wenersburgh, the great lake Wener opened upon me with all the characters of the ocean: the banks are low, and the horizon is more than one half sky. A little below Wenersburgh I caught the first view of the Gotha, a very fine, clear, and greenish river, about the size of the Rhone at Lyons. It pours with great fury beneath a bridge thrown from rock to rock, over which we passed, and makes a fine rapid, or almost a fall; there is another rapid or fall of the same kind just below. The banks are well wooded; but here, too, there are no very fine distances. A sort of extended ridge of rock capped by pines stretches to the left, and may have been an ancient bank of the river; from its distant appearance, I should conjec-

ture it to be trap : granite is the rock of the country. I passed by some small lakes, over some wild heaths, and at last came upon the white foam of the cataract of Trolhetta, rising like smoke amidst the village. The river above is a fine, wild, and tranquil expanse : at first it is tortured in its fall by saw-mills, but at the second fall they disappear. Here there is nothing but the grand forms of nature ; the bold, grand cliffs 200 or 300 feet high, covered with an almost infinite variety of kinds of wood, and capped by gigantic pines. The water is beautifully clear, and the rapids and falls for nearly half a mile present a variety of picturesque effect. Here a deep whirlpool beneath a fall of twenty or thirty feet in height, and where the river is pressed into the narrowest possible channel ; there a succession of rapids, and all white foam, and force, and thunder. I fished, and caught nothing but a little trout as long as my hand ; though I was told of large trout of six, seven, or eight pounds, inhabitants of the pool below the mill ; yet the evening was favourable, and I tried my best flies and my best skill. The inn was very bad ; the master and mistress, the governess and children, feasting out and playing cards. It was on a Sunday that I arrived ; I could get nothing except what I brought and what my servant collected in the garden, and I was made sick even by this fare. I got up very early on Monday, and examined the opposite side of the fall, and went round to the locks,—a fine work of art, where the navigation is carried on between Gottenburgh and the Wenersee. The locks are deep in the gneiss and granite, altogether 120 feet in depth, and giving many fine falls and effects of water, where they are to be filled from the clear and beautiful stream of the

Gotha. The first natural fall seen from that opposite is very fine. There is an island covered with wood in the middle, which hides much of the saw-mills. The salmon never rise above the falls, and there are very few of them; I am convinced they can never abound where there are many saw-mills and much saw-dust. I left the wretched inn for Gottenburgh at nine this day. I got on much better; at least I had no attempts at imposition on the part of the peasants. Throughout Norway and Sweden, the only birds I saw by the road-side, except a few birds of prey, were magpies and hooded crows. The magpies were in myriads, and quite tame; so tame that I could have killed four or five together. The Swedes and Norwegians do not shoot them, and animals soon find out their places of preservation. There was more beauty in the road this day, particularly by the banks of a small lake, where there was a great extent of wood and rock and some islands; but this lake could only be called *pretty*. We passed through some large fine woods, and opened upon the Gotha, the banks of which down to Gottenburgh are green, with a plain or flat surface of heath intervening between the river and the hills. The hills possess some variety; and the granite crags and trees, and great diversity of hilly outline, are not devoid of picturesque effect.

“Gottenburgh is principally built of stone, has a few fine houses, and the Gotha and the harbour form important commercial characters. The inn, as usual, wretched. The *cuisine insupportable*. The bread was *cock-roach pudding*. I swallowed one, and found another. The fatigue of travelling, and the misery of this inn, which was like an oven, the windows

having been kept closed, and the bad food at Trolhetta, altogether brought on a violent bilious attack, with fever, which lasted four days. The third day, however, I went to the marshes, and saw Mr. Bloomfield shoot what appeared to me to be a *Finland snipe*. I went out myself the day after, and shot two or three wading birds, but found no double snipes. I shot a young snipe; and they say the double snipe sometimes breeds in this neighbourhood. I strongly doubt this. I found an old snipe, with a young one, the common snipe; and I think it very likely they have been deceived in taking the young common snipe, which is larger and fatter than the old one, for a young double snipe. Yet, the sportsman who spoke to me at Undervelle said he had seen some young double snipes, and he seemed to me to know the habits of these birds well. He likewise described the breeding habits of the woodcock, and stated that they were not uncommon in the summer in the great woods of Sweden. I went out the next day shooting, to endeavour to ascertain more about the Finmark snipe; but found no double snipes, and killed only a duck and a snipe, and could find no Finmark snipes.

“ This day saw the Crown Prince of Sweden, and his Princess. He received me amiably, and talked upon a great many subjects, and generally well; seemed to understand something of chemical science, and had general views upon all the sciences, and enlightened ideas upon education and the policy of kings. He asked me to dine with him. I sat on the left of the Princess, the Governor of the town sitting next her, and a lady of the court next me. She has a beautiful *upper* countenance, and fine blue

eyes, but I should think her constitution feeble; the granddaughter of the poor Empress Josephine, and very graceful and gracious in her person and manners. She talked to me about her grandmother, and Thorwaldsen. He entered into a long conversation with me after dinner, "*de omnibus rebus et quibusdam aliis*," particularly Lancaster schools, and the atomic system of chemistry, and Prince Christian of Denmark.

"Mr. Nolan is a very hospitable and amiable merchant: lent me a carriage to come on to Heisingburgh, and I hired a man to take charge of me to Copenhagen, and to take back the carriage. My first day was to Falkenburg; the road was very pretty for the first two or three parts, and then became very dreary, like the wildest part of the low country in Aberdeenshire. There was very little pine wood; and barren heath and barren rocks formed a considerable part of the country, with some barley and rye, and the rye cut, and potatoes here and there, and peat bogs. At Falkenburg, I went immediately to the river, and fished, but raised nothing. Next morning I went out, and soon roused and hooked a salmon, and fished with a good deal of spirit till dinner time. I killed four small salmon; two I hooked and one I killed having seen them under the bridge; and in the evening I killed two more. Altogether, I hooked nine or ten, and killed six; but the largest was not six pounds, and some of them were, I think, the *salmo eriox*; but they were good sport, and took freely. I think there was a place further up where I should have had better sport, and which I saw only in going away. At La Holme I saw a very fine river, and was half inclined to stop; but the wretchedness of the inn pre-

vented me. I saw a man fishing with a very large number of *lob worms*, with which they catch salmon, but they seem to know nothing of the fly. My guide at Falkenburg fished, and caught one grilse with a worm. Neither at Falkenburg nor at La Holme are there any saw mills, and hence, probably, the salmon are found in plenty. They have precisely the character of second-rate Scotch rivers, and are not so hardly fished; but I doubt whether the Swedish fishery, even in these rivers, can be reckoned superior to the Scotch. A gentleman had been there three weeks ago, and fished without catching a salmon; and, I believe, I raised most of the salmon that day in the pools that I tried. From the appearance of the river at La Holme, I am almost sure I should have killed salmon there; I saw a small grilse rise. The colour of these waters is peaty, and the fall at La Holme is close to the road. From La Holme to Helsingburgh the country has nearly the same character as that I have already described. There seems nothing ever prepared in the Swedish inns for travellers, not even the delicacy of kippered salmon. At Engelholme, I had to wait an hour for horses, and likewise at the stage next La Holme; for there I overtook my Forebode, though he had been sent fifteen hours before I left Falkenburg. At Helsingburgh I got a tolerable dinner, and a bed in an enormous room, probably the assembly room. Here I had an interview with Berzelius, whom I found in good plight, rather fatter than when I saw him twelve years ago. The next morning I hired a boat for Copenhagen, and left Elsineur and Hamlet's Garden on my left, and in four hours landed in the capital of Denmark.

Copenhagen is a pretty city; the palace a fine building, and the houses well built, and the inn tolerable. The voyage from Helsingburgh was always along the green fields of Zealand, which here and there were crested with low wood, not unlike the banks of the Thames, with many country houses, all of which had an English fashion. We passed by the Three Crowns battery, celebrated for its effect on the fleet of our greatest naval hero, and were, as usual, strictly examined at the custom house, which seemed to have for its object the extortion of money, rather than any real desire to prevent smuggling. I dined at the table d'hôte. The mistress of the inn was English, and had been probably a housekeeper or lady's maid, and had the manners which belong to the shabby genteel. The dinner was very good, and the wine excellent. I saw Professor Ørsted, and he showed me his apparatus for *increasing thermo-electro-magnetism*, but I have some doubts as to the multiplication. Found that Prince Christian was in town the day after my arrival, and went to see him. He received me in the kindest manner, without ceremony, and asked me to dine with him the next day. I accepted conditionally, provided the steam boat did not come, and fulfilled my engagement. I found him very amiable, in an agreeable country seat, living like an English country gentleman. His villa was very like an English country house of the second or third class. The Princess I found very much improved in health and person, and quite blooming. Ørsted was of the party, and some courtiers. The Prince walked with me round his grounds, and after dinner took me to the King's park — a deer park, like an English one; very extensive, with some tolerable trees. I drank

tea with the Princess, and then took my leave. The public seemed to consider the Prince's grounds as their own; for there were numbers of persons walking there, to whom he bowed, and had much of that courtesy to perform. He asked me to dine with him again on Sunday. I obtained leave from Prince Christian to shoot at Saltholme, where it was said double as well as single and jack snipes breed. I went there on Saturday, and found an immense variety of wading birds on this low and flat island; an infinite variety of the *Tringa* kind, red legs, green legs, the turnstone, the anocetta, the sandpiper — *Tringa alpina* — in its summer plumage, and exactly like a snipe. I think I saw one double snipe; but was not sure, as there were no white feathers in the tail. I unluckily did not go to the south side of the island till late, and then my *senza cura* servant, threw me out by not putting powder enough in my horn. The chasseurs here are all positive as to the existence of the double snipe as a bird bred in Zealand. I saw in the collection of Natural History the Norwegian white grouse, of the size of our grouse, and having precisely the same summer plumage. Query, is it not the same bird? Dined again with the Prince on Sunday; a visit of ceremony,—thirty people, and of course rather a bore. Went away as soon as possible. On Tuesday, took the Kiel boat, and had a pleasant sail to Kiel through the islands, and a most wretched journey from Kiel to Hamburg through sands and deserts.

“In going from Altona, August 8th, to a country seat, my companion in the carriage, as if casually, said, “That is the grave of Klopstock.” It was under a lime tree; but I lost sight of it, and asked

him to be so good as to point it out to me in returning. We returned at 10 o'clock, in a calm and beautiful evening. I saw two large stones surrounded by an iron paling; Klopstock's, and his first wife's and his second wife's tomb. On the side beyond the churchyard was an illuminated gate, and we asked why it was so illuminated. At first I thought it was an honour paid to the grave, and the memory of one of the greatest poets Germany has produced. It turned out to be a kind of Vauxhall, into which we entered, and saw a rabble, not one of whom had perhaps ever heard of Klopstock. Such is glory and greatness! — such the illustrious dead! The poet of the "Messiah" has, however, a name for this generation; and we know his birthplace and where his bones lie.

"This day went in search of the double snipe, and did not find one; but Count Blucher, the Governor of Altona, sent me one, which was in excellent condition, and probably a young one. It had no white feathers in its tail, but some whitish ones, and had the speckled breast which I have always seen in snipes of this kind. The whitish feathers were spotted; whereas in the spring bird I have always seen some pure white feathers. I have now no doubt that the bird I saw at Saltholme was one of this species; and I regret I did not examine more the south part of this island, where they are said to breed.

"Hamburgh is a great commercial city, with plenty of luxury and vice. The banks of the Elbe something like the shores of Zealand; and indeed the description of green fields, marshy banks, and
 ; applies to all I have seen in the uncultivated parts of Holstein and the Danish islands. Hanover rises in the back ground as a group of

black and wooded hills. I have agreed to go to Bremen with Schumacher, to see Gauss and Olbers, and I hope I may be in England by Sunday or Monday. I do not like, however, to go without a day's shooting; and I shall try again this day, August 9.

"I did not describe the villages in Holstein; but at Keil the women appeared handsome, and upon a large scale; and the houses of the farmers had a grand display of culinary utensils, and looked in the country as if all roof. I saw water meadows, and rye cut, and some oats and barley. The horses exceedingly fine and large; but I should think with less blood in them than the English horses: this struck me in Denmark. The Danes and Holsteiners appear to be rather *fat headed*, and a feeding and smoking people.

"This day (August 9.), I have been out in a flood of rain, and hunted over a great extent of excellent moor, and found fewer snipes than we should find in the same ground in England and Ireland, — much fewer than in Ireland and Scotland. But in that kind of ground so favourable to the double snipe, a long grass, with water covering it, and green, we found two double snipes; but, as it proved, they were very wild. One I saw; it had no white feathers in its tail, like the one I saw in September at Venice. Query, is this bird a distinct species, or is this the summer plumage?

"August 10.—I dined with Professor Schumacher, whose amiable qualities have impressed me more the more I have seen him; and after dinner crossed the Elbe to Hamburg. We were only an hour on our passage; and the distant view of Hamburg and Altona, and the green pastures, and wooded banks of

the Elbe, are not displeasing as a view. It was full tide, and the water came very high; so that various wild flowers appeared, with only their extreme branches above.

"The day after we rose at six, and proceeded to Brëmen, through a country where heath and wood were the principal features. On a heath near Ham-burgh, I saw a covey of partridges, which, with two or three snipes on a moor near Rottenberg, were the only game I had seen from the roads on the north. Forests of great extent, with small hills, heaths of great magnitude, and cultivated but not inclosed land, are the characters of Hanover. The peasants were good-looking, the women handsome; the inns appear better than any in the north; the post-horses are good, but they are slow; and the road, though a work of Napoleon, heavy.

"11th.—Dined at the inn late, and had a very fair supper, and found the inn tolerable. The next day dined with Dr. Olbers, and saw with much pleasure the telescope with which he discovered his two new planets, and met Gauss. Olbers gave us an excellent dinner, and is a most amiable and enlightened philosopher. I spent a very pleasant day. He introduced me to a sportsman, who asserted, in the most decided manner, that the double snipe breeds in Hanover, and promised to send me young ones. He says the males assemble in the month of May, and make a great noise, and that they breed in the great marshes. I saw one in the Museum with the eggs, which seems to confirm his account.

"I find such difficulties made with respect to the chase here, that I gave up the idea, and on Friday came down to Bracken along and on the water, which

has nothing picturesque ; and this morning (14th), I am on the sea of Vauderagg. I am rejoiced that, I made the excursion to Altona and Bremen: it has given me a better idea of human nature ; for Schumacher, Olbers, and Gauss appear to me no less amiable as men than distinguished as philosophers ; and they have all the simplicity, goodness of heart, and urbanity of manners, which ought to make us proud of their name, and of the influence of intellect, and scientific pursuits upon the morals, the habits, and the affections."

Amongst his note-books a few other vestiges of this excursion remain. Of a poetical kind are some lines written at Copenhagen, as the date indicates, expressive of his reflections on the evanescent forms of things, and the permanency of intellect : —

" Copenhagen, August 1. 1824.

" Whatever burns consumes, — ashes remain ;
And tho' in beauty and in loveliness,
And infinite variety of forms,
The primitive beings alone, their relics sad
Have the same pale and melancholy hue.
Such are the traits strong passions leave behind,
Consumers of the mind and of the form.
The auburn, flaxen, and the ebony hair,
Take the same hoary hue ; the blooming cheek
Of beauty, the bronzed brow of manly strength,
And the smooth front of wisdom, sadly show
The same deep furrows : intellect alone
Does not so quickly waste itself ; but like
The tranquil light which in the ocean springs,
When living myriads in succession quick
Sport on the wave, it lives, and in the storms
And change of things appears more beautiful,
Triumphant o'er the elements."

The distinguished men of science whom he had the good fortune to meet he thus notices, in those

sketches of character, which, as already mentioned, he amused himself in writing in his last days: —

“ *Berzelius* was the worthy countryman of *Scheele*, and certainly one of the great ornaments of the age. Indefatigable in labour, accurate in manipulation, no one has worked with more profit. His manner was not distinguished, his appearance rather coarse, and his conversation was limited much to his own subjects.”

“ *Ersted* is chiefly distinguished by his discovery of electro-magnetism. He was a man of simple manners, of no pretensions, and not of extensive resources; but ingenious, and a little of a German metaphysician.”

“ *Gauss* appeared to me a very superior man. I met him at the house of *Olbers*, in Bremen: a delightful philosopher, with a passion for astronomy only surpassed in ardour by that possessed by *Schumacher*. I was equally pleased with the manners, with the liberality, and social gaiety of these three celebrated men, with whom I spent one of the most agreeable days belonging to the later period of my life.”

The following year after the conclusion of the session of the Royal Society, he visited the north of England; and during the Christmas holidays he passed a short time in South Wales. This I collect from letters preserved, which he wrote to his mother in his absence, and from lines giving expression to trains of thought composed amidst the wild and beautiful scenery of Westmoreland.

The latter are all of a serious, meditative kind.

As displaying the workings of his mind; they may interest kindred minds; and in their humility, as well as in their lofty aspirations, they may prove edifying; — two considerations which induce me to give them, though they are unfinished fragments: —

“ Ulswater, August 4. 1825.”

“ Ye lovely hills, that rise in majesty
Amidst the ruddy light of setting suns,
Your tops are bright with radiance, whilst below
The wave is dark and gloomy, and the vale
Hid in obscurest mist. Such is the life
Of man; this vale of earth and waters dark
And gloomy; but the mountain range above,
The skies, the heavens are bright. There is a ray
Of evening which does not end in night, —
A sun of which we catch uncertain gleams
In this our mortal state, but which for ever
Shines from afar, wakening the spirit of man
To life immortal and undying glory!”

“ Ulswater, August 5. 1825.”

“ It is alone in solitude we feel
And know what powers belong to us.
By sympathy excited, and constrain'd
By tedious ceremony in the world,
Many whom we are fit to lead we follow;
And fools, and confident men, and those who think
Themselves all knowing, from the littleness
Of their own talents and the sphere they move in,
Which is most little, — these do rule the world;
Even like the poet's dream of elder time,
The fabled Titans imaged to aspire
Unto the infinitely distant heaven,
Because they raised a pile of common stones,
And higher stood than those around them.

————— The great is ever
Obscure, indefinite; and knowledge still,
The highest, the most distant, most sublime,
Is like the stars composed of luminous points,
But without visible image, or known distance.
E'en with respect to human things and forms,
We estimate and know them but in solitude,
The eye of the worldly man is insect like,
Fit only for the near and single objects;

The true philosopher in distance sees them,
 And scans their forms, their bearings, and relations.
 To view a lovely landscape in its whole,
 We do not fix upon one cave or rock,
 Or woody hill, out of the mighty range
 Of the wide scenery, — we rather mount
 A lofty knoll to mark the varied whole, —
 The waters blue, the mountains grey and dim,
 The shaggy hills and the embattled cliffs,
 With their mysterious glens, awakening
 Imaginations wild, — interminable !”

“ 1825.

“ And when the light of life is flying,
 And darkness round us seems to close,
 Nought do we truly know of dying,
 Save sinking in a deep repose.

“ And as in sweetest, soundest slumber,
 The mind enjoys its happiest dreams,
 And in the stillest night we number
 Thousands of worlds in starlight beams ;

“ So may we hope the undying spirit,
 In quitting its decaying form,
 Breaks forth new glory to inherit,
 As lightning from the gloomy storm.”

This autumn he experienced increasing indisposition ; and, what was very unusual with him, he seems to have experienced some flagging of that extraordinary elasticity of spirit which had hitherto carried him lightly and joyously through life, over all its rubs and cares. Thus, in a letter to his mother dated October 9th, alluding to a family circumstance which occasioned him some anxiety, he says, “ and being myself unwell, I feel more uneasy than if I were in rude health.”

The following spring, that of 1826, after an ailing winter, there was an increase of his indisposition. This is described in a letter to his sister, which he wrote on the occasion of our mother's illness : —

" June 2d.

" MY DEAR SISTER,

" I have been much grieved, and somewhat alarmed, to hear of my mother's illness. Pray write me by return of post, and say how she is, and give me a line every second day till she is convalescent. I hope, however, most ardently, that she is no longer suffering.

" Lady Davy is quite well ; but I have been much indisposed, and now write with difficulty from rheumatism in my right hand and arm. I think I shall not be well till the weather changes.

* * * * *

" I hope John will be promoted, and return in October for two or three months, and that we shall see you all well together in November. If it please God, I will certainly be at Penzance the last week in October, or the first in November. With affectionate love and kind duty to my mother,

" I am, dear Kitty,

" Your affectionate Brother,

" H. DAVY."

The hope expressed in this letter, of a happy meeting of our family under our mother's roof, was not permitted to be fulfilled. Our respected mother, after apparently rallying from her first attack of illness, was suddenly carried off by a fresh accession of it. This happened in September, and my brother's health soon after sensibly deteriorated. He experienced more frequently troublesome symptoms,—such as uneasy feeling and slight numbness of the right hand, and sometimes pain of the forearm, shooting

up to the chest ; with occasional inordinate action of the heart, and occasional pain and weakness of the right leg. By one of his medical advisers, the pain and numbness of the hand and arm, which on the whole were the predominant ailments, were attributed to an old sprain of the wrist ; by another his indisposition was referred to increased flow of blood to the head ; and by a friend, a physiologist, to weakness of the heart. He was rather disposed to follow the advice which was most agreeable to the convivial epicurean habits of London society, and adopt a strengthening diet, as it is called, of animal food, than an abstemious regimen. For some time he ate meat three or four times a day ; but he did not improve. When he delivered that discourse which was his last to the Royal Society, at the anniversary meeting on St. Andrew's day, 1826, it was done with such effort that drops of sweat flowed down his countenance ; and those who were near him were apprehensive of his having an apoplectic seizure ; and he was so much indisposed after, that he was unable to attend the dinner of the Society. That day he had the honour of being elected President the seventh time.

When I returned to England in December of the same year, I went to see him at the house of his friend, Mr. Watt Russel, in Northamptonshire, where he was on a visit. He looked well, but stouter than when I left him on my going abroad four years before. But though he complained of his hand and foot, and of general indisposition, he took exercise, and went out with his gun ; and he was still on a diet chiefly of animal food, and on a large allowance, his appetite not being bad. We travelled together to London, and in a few days parted to go into different

parts of the country. About a fortnight after, when I was at Hilstone House in Monmouthshire, I had a note from him, dated London, begging me to come to him, as soon as I conveniently could, for he was ill. In less than two days I was with him, and I found him much worse than I expected, and labouring under a paralytic attack, affecting the right side. It had come on suddenly while shooting at Lord Gage's. On his arrival in town, to which he hastened, he had put himself under the care of his old and kind friend Dr. Babington, and of Dr. Holland. The medical treatment employed appeared to have had little or no beneficial effect. As he gained strength, however, the symptoms gradually diminished, and we were very sanguine that he would recover completely.

Fortunately, the faculties of his mind were not impaired, and he had pleasure in the moderate exercise of them. During confinement to his room, he corrected the proof sheets of his "Discourses to the Royal Society," which were published in quarto, in January, 1827. From reading he derived much amusement, or rather, I should say, from being read to. The kind of reading he was then most fond of was novels and romances, and for some time it was our almost constant occupation. He, however, then contemplated the time when he hoped to be able to resume his former pursuits; and the first undertaking he meditated was the finishing of his "Elements of Chemical Philosophy," after the same plan as that on which it was commenced, — of original research, and the verification, by experiment, of the results of other inquirers; a design which, unfortunately, he was never able to accomplish.

By the 22d of January he was so far recovered as to be able to undertake a journey to the Continent. Change of air, the exercise of travelling, and change of scene, it was supposed, would be of service to him; and still greater negative advantages were calculated on, in favour of his recovering abroad, in the absence of the many annoyances and causes of injurious excitement to which he was exposed at home, and especially as President of the Royal Society. Some of these annoyances have already been pointed out; and others of a higher kind might be mentioned, indicated in those unhappy dissensions which soon after broke out under his immediate successor, so injurious to the interests of the Royal Society and science. These are forcibly portrayed, at least the spirit which actuated them, in that work which they engendered, — a work, from its “dedication” to its “conclusion,” written in a manner little consistent with the *philosophical* character, though I hope it may, eventually, serve the cause of science.*

On the day mentioned above, we set out from London together to go into Italy. It was a dreary beginning of a dreary journey. The winter had been open till then; that morning a snow-storm began, and continued all the way to Sittingbourne, where we slept. The following day was fine sunshine, clear weather, and we had a pleasant drive to Dover. His conversation that morning was particularly agreeable, and principally on geological subjects. Many of his ideas, he said, on these subjects had been appro-

* *Reflections on the Decline of Science in England*, by Charles Babbage, Esq. London, 1830.

priated by others, and had been published without acknowledgment of having derived them from him, either through his lectures or in conversation. He, on this occasion, gave me the outlines of the geological sketch which he has introduced in his "Consolations in Travel."

The following day we crossed the Channel in the steam-packet to Calais, off which we arrived when the tide was out, and had to be put on shore over shallows, and through breakers, by Frenehmen, who, by their mismanagement and bungling, appeared to be entirely ignorant of the duties of boatmen. Before we were landed we were wet; and we had then to walk over the sands, and jump across streams of salt water to get to the pier; and when at its foot, we had to climb a ladder to reach its summit, rather hazardous for any one not accustomed to climb, and dangerous for an invalid. We were little prepared for such a landing and scramble, and I was surprised at the manner in which he surmounted all the difficulties, and rejoiced that no bad effects followed.

The next day was partly employed in preparing for our journey, and in finding a carriage suitable to the season. The one he purchased, a postchaise, answered perfectly, and he used no other whilst on the Continent. We proceeded on the great Paris road as far as Amiens. There we struck off to Compeigne, expressly for the purpose of avoiding Paris, and the allurements, or rather excitement, of its society, which he apprehended it would be difficult to avoid if he stopped there. Had we been aware of the badness of the road, of the badness of the posting, of the delay in getting horses, and of the badness of many of the inns, we certainly should not have left the great

road. The weather, indeed, was severe, and there was an unusual quantity of snow on the ground, which added to the difficulty of travelling.

Our plan was to go forty or fifty miles a day between breakfast and dinner, which, with tolerable roads and horses, would have been easy; but frequently it was dark before we finished our day's journey. I remember, before we got into Compeigne we were benighted, and obliged to quit the carriage, the wheels of which were completely locked in frozen ruts, about a foot deep, at the beginning of a steep descent, and could not be extricated without assistance. Wrapped in his cloak, I helped him to the bottom of the hill, and he did not escape a fall or two by the way, from the slippery frozen state of the road. It was then dark. By good luck we discovered hard by a cottage, where we were kindly received; and whilst the men of the family went out to the assistance of the postilion and courier, we were accommodated with seats by a blazing wood fire cheerfully burning on a flat hearth in a great chimney, and had pleasure in seeing the comforts enjoyed by a peasant's family at this inclement season. Not unfrequently, from the manner in which the roads were obstructed with snow, we were under the necessity of travelling over ploughed fields. Though our carriage was tight, so as to exclude wind, and we were well provided with warm clothing, and my brother had a feet-warmer constantly under his feet, yet we felt the cold considerably. The glasses were generally coated with ice, and the thermometer inside below the freezing point; and a bottle of leeches in the carriage pocket was frozen the day we left London, and continued so till we arrived at Reggio. No one who has

not been out of England can have an adequate idea of the discomfort of a French inn in winter. On arrival we were shown into a room without fire; and when a fire was lighted, for the first hour it was rather a source of annoyance than of warmth, owing to the volumes of smoke which it poured forth. We found the freezing temperature every where within doors, and the thermometer often, at a distance from the fire, was several degrees below the freezing point. Nothing could be more dismal than the country and scenery the whole of the way to Lyons, especially in the great plains of Champagne,—uninterrupted plains of snow, as far as the sight could extend;—no object to arrest the eye, except a village here and there rising out of the white waste, or a distant steeple or some solitary tree. And in the towns in which we stopped, nothing to excite interest excepting the churches, which in this part of France are many of them splendid specimens of the richest Gothic, belonging, it may be said, entirely to past ages,—the majority of them neglected, and the few which were used and repaired in their interior of desolate appearance, damp and cold like the tomb; with which were quite in character the priests who officiated in them to naked walls, reverberating the sounds of their chanting in a most melancholy manner. We often visited these churches; and my brother never failed availing himself of the opportunity of falling on his knees, and in silence offering up a prayer.

It was with some hesitation that we took the road to Chamberry; to proceed through Savoy over Mont Cenis into Italy. In the deep Alpine valleys above Chamberry, we were agreeably surprised at finding less snow than in the low country, and less intensity

of cold. Verdure here and there appeared, bursting out of the snow in sheltered hollows ; and even amidst the snowy mountains, and the rivers almost buried in snow, and the pendant icicles, and the blue and frozen cataracts, there was a degree of liveliness imparted by the varied aspect of the larch, the birch, and the Alpine fir, which in forest masses so beautifully and gracefully clothe the mountains. In his valetudinary state even, he enjoyed very much this part of the road, especially between St. Jean de Maurienne and St. Michel, and St. Michel and Lansleburgh, where the scenery is of the grandest character, and appeared to great advantage, from the kind of weather we had, —a cloudy sky and drifting clouds, and partial gleams of sunshine, and occasional glimpses of blue sky, and of the peaks of the Alps of dazzling whiteness.

When we arrived at Lansleburgh, it was doubtful if we should be able to cross Mont Cenis : the accounts brought down by the peasants were of an unfavourable kind. There had been a storm of wind, and a fresh fall of snow. We watched the pines on the mountain heights with some interest, as indicating the state of the atmosphere in the upper region. The following morning, *en traineau*, the body of the carriage on one sledge, and the wheels on another, we made the attempt, and without difficulty reached the inn on the summit. Here we were detained the remainder of the day, the wind blowing strong, and the snow drifting, and the road beyond impassable : and in this dismal situation we passed the night. Though we had a large fire in our bed-room, which was also our sitting-room, the thermometer in it was at 20°, and in the open air on the snow at 10°. The following morning, the storm being over and the sky serene

and beautifully clear, we proceeded on our way, the Sardinian courier having started before us about an hour. Very soon we overtook his carriage, which was stopped by accumulated snow. A large number of people had been collected from the neighbouring valleys, and were hard at work, forming a road ; but as we saw little probability of its being soon rendered passable for our carriage, my brother accepted the offer of two stout mountaineers, and was drawn by them down to Susa in a small Alpine sledge with safety and rapidity, though in a manner not very agreeable, at least for an invalid, owing to the great steepness of many of the descents, and the heat of the sun in the very clear calm sky, and the reflection from the snow. The carriage arrived many hours after, in the evening.

On entering Italy, we had hoped that we should have taken leave of snow and the rigours of winter ; but we were disappointed. The snow through the whole of Lombardy was even deeper than in the passes of the Alps ; in many places three and four feet deep. The scene was quite arctic, not only on account of the dreary waste of snow, but even more so from the carts and waggons of the country being taken off their wheels and drawn on sledges, as if the inhabitants were familiar with snow, and prepared for it. Owing to the severity of the weather, we stopped some days at Bologna. When we arrived at Ravenna, in the first week of March, the snow was melting on the roofs of the houses, and was to be seen in the ditches some days after.

Notwithstanding this severity of season and difficulties in travelling, and various annoyances in connection with them, my brother, at the end of his

journey, was decidedly better than when he commenced it; stronger, less paralytic, and more active. His own state and feelings at this period are well described in a letter which he wrote to his friend Mr. Poole about three weeks after his arrival, part of which, with Mr. Poole's permission, I shall insert:—

“ I am, thank God, better, but still very weak, and wholly unfit for any kind of business and study. I have, however, considerably recovered the use of all the limbs that were affected; and as my amendment has been slow and gradual, I hope in time it may be complete. But I am leading the life of an anchorite, obliged to abstain from flesh, wine, business, study, experiments, and all things that I love; but this discipline is salutary, and for the sake of being able to do something more for science, and I hope for humanity, I submit to it, believing that the Great Source of intellectual being so wills it for good.

“ I am here lodged in the Apostolical palace, by the kindness of the Vice Legate of Ravenna, a most amiable and enlightened prelate, who has done everything for me that he could have done for a brother.

“ I have chosen this spot of the declining empire of Rome, as one of solitude and repose,—as out of the way of travellers, and in a good climate; and its monuments and recollections are not without interest. Here Dante composed his divine works; here Byron wrote some of his best and most moral (if such a name can be applied) poems; and here the Roman power, that began among the mountains with Romulus, and migrated to the sea, bounding Asia and Europe under Constantine, made its last stand in the marshes formed by the Eridanus, under Theodoric, whose tomb is amongst the wonders of the place.

“ After a month’s travel in the most severe weather I ever experienced, I arrived here on the 20th of February. The weather has since been fine. My brother and friend, who is likewise my physician, accompanied me, but he is so satisfied with my improvement as to be able to leave me for Corfu ; but he is within a week’s call.

“ I have no society here except that of the amiable Vice Legate, who is the governor of the province ; but this is enough for me, for as yet I can bear but little conversation. I ride in the pine forest, which is the most magnificent in Europe, and which I wish you could see. You know the trees, by Claude Lorrain’s landscapes : imagine a circle of twenty miles of these great fan-shaped pines, green sunny lawns, and little knolls of underwood, with large junipers of the Adriatic in front, and the Appenines still covered with snow behind. The pine wood partly covers the spot where the Roman fleet once rode. Such is the change of time ! It is my intention to stay here till the beginning of April, and then go to the Alps ; for I must avoid the extremes of heat and cold.” *

And to show further his state in regard to feeling and thought, and the unsubdued energies of his mind, I shall insert some lines which he wrote here, and which are preserved in his note books : —

“ Ravenna, March 1.

“ In ignorance of all things we assume
What reasonings most please us, and in things
The most unlike in form as well as essence
We trace analogies ; as if it were
A joy to blend all contrarieties,

* Life by Dr. Paris, p. 446.

and to discover
 In things the most unlike some qualities
 Having relationship and family ties.
 Thus life we term a spark, a fire, a flame ;
 And then we call that fire, that flame, immortal,
 Although the nature of all fiery things
 Belonging to the earth is perishable.
 The lightning, in its fierceness and its power,
 Is of an instant only !
 The meteor's blaze lightening the visible scene
 As transient is !
 And vainly should we search where these had been.
 The solar light, when the bright orb has sunk,
 Dwells not within known space ;
 And that which kindleth the whole frame of nature
 Has no abiding place, although its source
 Is everlasting : it lives but to decay,
 And in its course a million miles are nothing ;
 It passes from and through the infinite.
 So is our life of thought : we look not back
 Beyond a few short hours, — a life, a day,
 An age ; that period gone, we blend
 With future, and with past eternity."

" THOUGHT.

" Ravenna, March.

" Be this our trust, that ages (filled with light
 More glorious far than those faint beams which shine
 In this our feeble twilight) yet to come
 Shall see distinctly what we now but hope, —
 The world immutable in which alone
 Wisdom is found, the light and life of things,
 The breath divine, creating power divine,
 The *One* of which the human intellect
 Is but a type, as feeble as that image
 Of the bright sun seen on the bursting wave —
 Bright, but without distinctness ; yet in passing
 Showing its glorious and eternal source."

" Ravenna, April 2. 1827.

" Our life is like a cloudy sky 'midst mountains,
 When in the blast the watery vapours float.
 Now gleams of light pass o'er the lovely hills,
 And make the purple heath and russet bracken
 Seem lovelier, and the grass of brighter green ;
 And now a giant shadow hides them all.
 And thus it is, that in all *earthly* distance
 On which the sight can fix, still fear and hope,

Gloom and alternate sunshine, each succeeds.
So of another and an unknown land
We see the radiance of the clouds reflected,
Which is the future life beyond the grave!"

" Ravenna, April, 1827.

" Oh couldst thou be with me, daughter of heaven,
Urania! I have now no other love ;
For time has wither'd all the beauteous flowers
That once adorn'd my youthful coronet.
With thee I still may live a little space,
And hope for better, intellectual light ;
With thee I may e'en still in vernal times
Look upon nature with a poet's eye,
Nursing those lofty thoughts that in the mind
Spontaneous rise, blending their sacred powers
With images from mountain and from flood,
From chestnut groves amid the broken rocks
Where the blue Lima pours to meet the wave
Of foaming Serchio ; or 'midst the odorous heath
And cistus flowers, that clothe the stream-worn sides
Of the green hills, whence in their purity
The virgin streams arise of mountain Tiber,
Not yet polluted by the lowland rills,
Or turbid with the ruins of the plains,
As when in sullen majesty he murmurs
By the imperial city's fallen walls,
Laying bare the bones of heroes, and the monuments
Of generations of the ages past ;
Or rest might find on that cloud-cover'd hill,
Whose marble rocks are clothed with brightest green,
Where thousand flowers of unknown hues and names
Scent the cool air, rarely by man inhaled,
But which the wild bee knows, and ever haunts,
And whence descends the balmy influence
Of those high waters, tepid from the air
Of ancient Appenine, whose sacred source
Hygeia loves : there my weary limbs
I might repose beneath the grateful shade
Of chestnuts, whose worn trunks proclaim the birth
Of other centuries."

CHAPTER VI.

HIS OCCUPATIONS AT RAVENNA.—PURSUITS IN NATURAL HISTORY.—EXTRACTS FROM NOTE-BOOKS.—EXTRACTS FROM HIS JOURNAL THROUGH SOUTHERN AUSTRIA.—VERSES “ON THE FALL OF THE TRAUN.”—PART OF A LETTER TO MR. GILBERT, RESIGNING THE OFFICE OF PRESIDENT OF THE ROYAL SOCIETY.—CONTINUATION OF JOURNAL.—RETURNS TO ENGLAND.—OCCUPATIONS IN HIS VALETUDINARY STATE.—NOTICES OF HIS DIALOGUE ENTITLED “SALMONIA, OR DAYS OF FLY-FISHING.”—CHARACTER OF HIS FRIEND DR. BABINGTON.—EXTRACTS FROM SALMONIA.

As long as I remained at Ravenna, my brother's time was chiefly spent in taking exercise, in reading, and conversation. About eleven o'clock he commonly got on horseback, and with his gun and dogs, either wandered through the beautiful and extensive avenues of the Pineta, then exhibiting the first burst of spring, or followed the embankments of the marshes of La Classe, in quest of his favourite petzardone ; or, if disinclined for horse exercise, walked with me on the ramparts of the city, then covered with fresh green turf, and well exposed to the mild and freshening breezes which at that time prevailed. Reading occupied a part of every evening, mixed with conversation either on what I read to him or on miscellaneous matters, and occasionally interrupted by a game at *écarté*. The reading he then preferred was Lord Byron's poems, of which we had procured a convenient travelling copy, in one volume, at Calais. The place gave additional interest to these poems :

he had there met their noble author and the lady of his love*, under whose influence the muse of Byron had made some of her best efforts; and at that very time this amiable and talented woman was at Ravenna residing with her family, and occasionally honoured our invalid with a visit, even within the walls of a palace, the official residence of those she must have considered the enemies of her race, the most respected of whom, including her father, were then in exile in consequence of their free political opinions in opposition to the government.

After I had parted from him in the beginning of March, to return to Corfu, his health continuing to improve, he became capable of more exertion, and had greater power of amusing himself. He resumed some of his scientific pursuits, and followed natural history, in connection with shooting, with much zeal. The weather being favourable, he spent a considerable part of each day in the open air; and when within doors, he found occupation in noting down his observations, in examining the birds which he had shot or purchased, or in making experiments.

The contents of his note-books kept at that time are copious, and fully confirm what I have just said. Under the head of "Hints and Experiments in Physical Science," he gives an account of various experiments which he either made or proposed to institute, relative to magnetism and electricity.

He first proposes to try if there is not a radiation of magnetism from the sun, and likewise from the moon. "If so (he says) needles may become magnetic on exposure, though wrapped in opaque matter, as tin foil."

* The Countess Guiccoli.

He next details several experiments which he made on the effects of light on needles, the results of which were not altogether decisive. He commenced them on the 23d of March; and they are introduced with this remark: —“ The results of Baumgartner * may depend either upon the *colour* given to the steel by oxidation, or to the negative effects of the oxide as an electrical agent.”

On the 30th of March, he writes — “ I had every thing ready for three sets of experiments on the electricity of the torpedo, but the fisherman failed me, — the animal was dead. I had intended to try, first, if the shock affected the needle; secondly, if it magnetised steel; thirdly, if it produced heat.”

On the following day he enters an account of an experiment undertaken for the purpose of ascertaining if any electro-magnetism follows the nervo-muscular action in the galvanic experiment of the contraction of the legs of a frog. He thus describes the result: —

“ *March 31.* — Tried an experiment on the thighs and legs of a very large frog recently killed. Wire of platinum was connected with the multiplier, and with the two crural nerves, and a large piece of foil of zinc was placed under the thighs; the communication was made through the multiplier; violent contractions of the muscles took place, but there was no magnetic effect. The muscles were washed in weak sulphuric acid, but still there was no magnetic effect; but when the platinum wire was inserted deep into the muscles, so as to make a better conducting chain, there was magnetic effect. The nerve is evidently not a sufficiently good conductor to transmit electricity enough for this effect, *and no electricity is developed by the contraction.*”

* Annales de Chimie et de Physique, vol. xxxiii. p. 333.

Under the head of "Natural History, Notices, and Notes," he collected a great deal of information respecting various objects, and obscure parts of natural history about which he was interested, especially relating to birds and fishes: as the locality of the ombre chevalier and its peculiarities; the migration of animals; the history of the double snipe or petzardone; the generation of eels; the different species of the genus salmo, &c. I have given the subjects in the order in which they occur; and I may offer, in the same order, a few extracts in illustration, commencing with the "ombre chevalier," of which he gives the following notices:—

"Being in the neighbourhood of Geneva in the beginning of February, I was anxious to gain information respecting and to examine this fish. My courier, Borelli, was well acquainted with it as a fish of prey, caught generally in the winter months, and at that time not uncommon in the part of the lake near Vevay, biting at small fish, and taken both by hook and net. At Lyons I could find none; they were said to be too dear to be in the market this year; but at Chambery I found that they were not uncommon, being brought not from the Lake of Geneva, but from that of Borguet, four miles off. There had been some in the market the day I arrived; and the day after my courier bought one, which he said weighed a pound and a half, for four francs and a half, probably double its price, as it was a *second* sale, bought from a restaurateur. This was Feb. 11. It was of a beautiful silvery whiteness, not unlike a whiting in brilliancy; the scales very small; the form exceedingly like that of a char; and the light greyish green of its back very similar to that of the char. It

was fifteen inches long, and seven and a half in circumference (the thickest part); there were no spots on the body, and a few large cloudy spots on the fins, those on the dorsal fin being bluish grey: the anal fin was yellow, with a shade of pink; the pectoral were reddish brown, and there was a slight tint of pink at the origin of the tail. It was exactly like a char, except that the body was silvery white.

“ The dorsal fin, radii (counted with care) 12.

Bronchial (pectoral) - - - 9.

Anal - - - 11.

Ventral - - - 8.

Caudal - - - 24?

“ The two last radii of tail cut, and therefore not so certain. The fish is evidently congenerous with the char. I am not sure that I have not seen it in England among fish from Windermere. Its teeth are numerous, and large for its size; its stomach very thick, and it is evidently fond of cool water. It is said to be found only in the lakes of Neufchatel and Geneva. How true this is my notes tell. It will probably be found in other lakes amongst the Alps which are deep, and similar in bottom to those of Borguet and Geneva. Block's figure of this fish is not bad, though he has not given the colours of the fins.

“ I ate it for dinner the 11th. It was excellent, the flesh approaching to cream or cheese colour; its taste like that of a char: it was fat and delicate in flavour, and one of the best fishes I have ever tasted.”

This description (I may remark) is partly from notes taken at the time, and partly from memory.

We were then passing through Savoy on our way to Italy ; and I have a distinct recollection of the pleasure with which he examined this fish, which he had never seen before. It was brought just as we were stepping into the carriage, and he instantly began the inspection of it ; and before we reached the next post had ascertained its peculiarities, and noted down the principal of them.

The next notice is relative to the “ Migration of Animals,” founded on observations which he had in part made this winter and spring : —

“ There is some intimate connection between the state of the atmosphere in different regions of the globe ; the double snipe, the quail, and the woodcock, never leave their haunts in the south till the temperature of the north is fit for them, and this year the migrating birds are all late, the snows which fell in the end of February still covering the north of Europe in the middle of March.”

This is followed by a detail of observations on the double snipe, a bird in which he took a lively interest, both as a sportsman and naturalist, — observations, if I am not mistaken, worthy of being preserved, as a valuable contribution to the natural history of this curious and little known species of scolopax. He commences by giving the names by which it is called in many different parts of Europe : —

“ The Double Snipe, or Solitary Snipe.

Scolopax rectivolans, Lin.

Petzardone of the Romans.

Starnotti — Neapolitans.

Coccolone — Tuscans.

Cavertone } — Ravenna.
Cavretone }

“ Jokelter } of Carniola.
 Jokelta }
 Trodecker of the Danes.
 Pool sneffer — North of Germany.”

He continues : —“ I had often heard of this bird, and seen it in collections ; but the first I ever saw alive was in the Maremmi, near Venice, in September, 1816. It rose under my feet, and flew like a quail, straight forward, showing white feathers in its tail : its flight was short. I fired both barrels at it, and missed it ; and again it had a second escape, and then took a high and distant flight. It was, I think, about the third week in September : I have every reason to believe they are very rare in this season in Italy. A person at Ravenna told me they were sometimes found as late as October ; but very seldom. The spring is the great season of their migration through Italy, from probably the 15th of March till the middle of April, and sometimes later.

“ In the spring of 1819 I killed one, the 19th of March, at Maliana, near Rome, and several in the same place before April 11th. I found them likewise at Palude and Remito this year, and killed two or three in the end of March. But the place where I had the best opportunity of observing their habits was at Colfiorito, in the Appenines, where I took my station at Casa Nuova for three nights. I arrived there the 15th or 16th of April ; and the morning that I arrived I killed five, and five after dinner ; ten the following day ; and four or five the last day, in a very short beat.

“ They were found in flocks, but scattered ; sometimes eight or ten together ; oftener three, four, or

five ; and sometimes one or two, not near, but many yards apart.

“ This year this singular spot was in the best possible state for affording them shelter. The grass was high in or round the five or six little lakes, filling the cavities in the hills. The temperature was low ; the thermometer standing at 10° or 12° Reaumur, at eight in the morning, and did not rise in the day to more than 13° or 14°. The grass in the meadows is generally high, and beautifully green, with a quantity of moss ; but I found them likewise in coarser rushy grass, where there was a little water.

“ Various species of waterfowl make this spot their place of rest, in migrating from the south to the north in spring: the dark purple ibis, here called *corvus aquatica*, four species of water rails, two not larger than larks, different wading birds of the *Tringa* genus, &c.

“ In 1820 the migrating birds were later ; and yet the winter had been mild in southern Italy, and there were very few ducks in the Pontine marshes. Probably there had been more rain and snow than the year before. There were some petzardone in the market in March ; but though I beat the marshes at Rome constantly from the 10th March, I found no petzardone till April 5th ; and that day, after a sirocco the day before, there came a great flight. I killed six, and Lord St. Asaph, who was with me, a few more, besides common snipes, at Maliana. The 7th I killed twelve petzardore, nine common snipes, and four rails. The 11th or 12th I left Rome for Colfiorito. I found this year the lakes full of water, snow still on the sides of the hills, and no cover for the birds ; the grass on the sides of the lakes was so low, that the double snipes could not hide themselves.

I found two petzardone on the banks of the upper lake, walking about, and shot one of them. I shot one or two more, but I had no sport. The petzardone are easily shot when they just rise, and seldom make a long flight; but after being raised two or three times they run, and afterwards often fly to the nearest wood. They lie very close the first time they are found. The smallest animal, which I suppose to be the male, has darker legs, and I found in one a little red behind the ear. The organs of hearing are very large, and they usually begin to rise when they hear a noise; so that nothing so much contributes to spoil sport as talking or calling to the dogs. They differ from the common snipe in having a shorter beak, and in weighing nearly twice as much, in having a spotted red and white breast; and in spring all have white feathers in the tail.

“ Being in Sweden, Norway, and Denmark in the summer of 1824, I inquired into the habits of the same bird. The accounts of all sportsmen are that they breed in those countries. I saw a nest and eggs of one in Denmark, in the museum; and the 8th or 9th of August one was sent me by Count Blucher, of Altona, who said his sportsman had killed five or six. It was very fat, and I should think a young one. It was exactly like the spring bird of Italy, except that it had no *white* feathers in the tail. On the 12th of August I went to the marshes, where these birds are said to be found. It was a very wet day, a flood of rain. I found one, but it was very wild, and had no white feathers in the tail. I did not get a shot at it. It was in the same kind of long rushy grass in which they haunt in Italy, and probably in the African rivers. At Gottenburgh, in the beginning of August;

about the 1st or 2d, I looked the marshes over. I found snipes, and young snipes, and young reeves, and ducks; but no double snipes, though the ground appeared excellent for them. They appear here later; so that probably they breed further north, in the Lapland marshes, and a few only haunt the coasts of the Baltic. That they do occasionally breed there, I think can hardly be doubted. Even at Bremen, a sportsman assured me of this; and at Undevälle, in Sweden, another told me he had found young ones not many miles from the town that could hardly fly, and that were so fat that they burst in their fall. The Bremen sportsmen assured me, that the males made a noise and assembled. Query, Did he confound them with ruffs? I have often heard them make a sort of bleat or suppressed murmur in rising; a noise like that of the bittern, but infinitely feebler.

“My brother says they appear in the Ionian Islands in March, and he has one shot in Corfu in May,—one of three; and he believes they are found in the Troad in February, and he has heard that they are found all the winter long in Sicily.”

The mysterious subject of the generation of the eel had for several years attracted his attention, and it continued to interest him during the remainder of his life. At this time he put down the information relating to it that he had collected, both from authors and his own observations. The extracts I shall give will relate chiefly to the latter.

He enters on the subject by expressing his opinion that nothing satisfactory had yet been written on the question; and that notwithstanding Sir Everard Home's paper published in the *Philosophical Transactions* for 1823, endeavouring to prove the animal

an hermaphrodite, the problem of its mode of generation remained unsolved. He refers with commendation to Spallanzani's excellent memoirs on fresh water eels; who chiefly confutes the opinion that the animal is viviparous, showing that what have been called capillary eels are intestinal worms.

He is disposed to adopt the opinion of Malphigi and Valisneri, that the two sets of fringed bodies anterior to the spine are ovaries, which Spallanzani doubted, because they do not become much larger in the migrating eels. "But (he remarks) it is possible that the migration is not owing to puberty, but a consequence of increase of size, and the greater difficulty of keeping a large mass warm in *winter*. A little eel can hide itself in mud, where a great eel would be very uncomfortable; and the *salt* water, and still greater increase of bulk, may be necessary to the developement of the ova." He continues:—"The eel in the sea is the animal to look to, and it is on this that I have induced Sir E. to work. If the conger be the same animal, there can be no doubt of its possessing the ova; at least I have no doubt, though I still have of its double sex.

"The fishermen of the Mount's Bay, who have opened thousands of great congers, say they have never found roe; but this may be from the peculiar character of the *ovaria*. I opened two in December, 1821, and found the large spinal fringes, but no distinct ova. It would be well to examine the chemical nature of these fringes in October or November, and again in February or March. The young eels must be born about this time.

"That all eels migrate from the *sea* there can be no doubt, and they seem to be born in different years at

different times. In 1823, there were millions at the fall at Ballyshannon in July. In 1825, at the same season, there were hardly any. The first was cold, the other a hot season. Or is the *fresh water* necessary to the growth of the young eel? When, in the winter of 1821, in not very cold weather, I put eels of different sizes into salt water, all the small ones *died*; and the only one out of six or seven that lived was nearly ten inches long. The death of the smaller ones was rapid in proportion as they were smaller; yet I have seen eels of all sizes in *summer*, in pools on the sea shore, but *never*, I believe, in winter. Is sea water a better conductor of heat?

“The fact mentioned by Sennebier, that there are eels in the Lake of Neufchatel, which communicates with the Rhine by a small stream, and none in the Lake of Geneva, where they cannot rise through the subterranean fall of the Rhone, is another fact in favour of my opinion. The experiment to make would be, to confine large eels in salt water ponds, and see if they become congers; and to confine a conger or two in salt water, and see if they will generate fresh water eels.”

These notices on physical science and natural history were made between the 12th and 23d March, and they are followed by others on the latter subject, and on meteorology, sufficiently showing the activity of his mind. Indeed, hardly a day passed whilst he remained at Ravenna, that he did not make some entry into his note-book, describing either a fact he had observed in his day's exercise, or some information he had collected from a brother sportsman, or the result of a dissection of a bird or fish, or a hint for an experiment, or the state of weather and his own

feelings as an invalid, intermixed occasionally with some short expression of religious and grateful feeling. I shall introduce a few instances :—

“ *March 16th.* — The high soaring of the swallow indicates fine weather ; because the warm air is *above*, and in the warm air flies are found, and the swallows follow them.

“ Here, at Ravenna, the 14th and 15th of March, when the thermometer was at 60° or 58° in the evening, I saw bats flying about, the first that have appeared since December 31st, when I saw them in England on the coast of Sussex. Have they intervals of torpidity, and do they wake for a day and then sleep again ? This evening (the 16th) the thermometer was below 54°, and no bats made their appearance.

“ On the 14th I made use of two leeches, which bit immediately, and performed their office well ; yet they had been frozen from January 23d to February 22d, and had been sometimes exposed (as on Mont Cenis) for more than fifteen hours to a temperature below 10° Fahrenheit. They were thawed very gradually, and appeared dead when first thawed, but recovered in some hours in a warm room. They had all (there were twelve) adhered together in a sort of ball, and were precisely in the centre of the bottle, at the greatest distance from the cooling causes.

“ 24th.—This day I dissected a spigola (*Perca marina*), a fish said by Cavolini to be an hermaphrodite. I could see no distinct melt, so as to be convinced of its double sex. The ovaria were very small loose bags, and of course were quite in an immature state. It was said to be a pound and a half.

“29th.—Beat the marshes, where a sportsman told us he had seen a petzardone yesterday, but found nothing. Met a sportsman, who had beat them before in the morning, and who had killed a double snipe, which I bought. Examined it minutely. The legs as well as the breast spotted; there was no red behind the ear; the legs of this were pale green. My guide says that one was killed on the 24th; they are now certainly come.

“Saw a crane at the Classe this morning, a magnificent bird. Saw an eagle last week soaring above the Pineta.

“April 6.—Did not shoot, but returned *thanks* to the Great Cause of all Being, for all his mercies to me, an undeserving and often ungrateful creature; but now most grateful. May I become better, and more grateful, and more humble-minded every day!

“A beautiful day, but a strong and cold-feeling wind: thermometer in the shade at three 63°, and its moistened bulb 53°, so that the difference is 10°. Wind east.

“7th.—A sportsman here, Civilieri, says he has always seen petzardone from the last week in September till the middle of October. Do they come singly and not in a flock, being guided by the search of food, and not by the reproductive instinct?”

He remained at Ravenna till about the 10th or 11th of April, and then proceeded northward, for the purpose of avoiding the daily increasing heat of Italy, with the intention, which he fulfilled, of passing the summer in his old haunts amongst the eastern Alps.

The journals which he kept during this period, like the one referred to, are very descriptive of his state and feelings, as well as of his pursuits and zeal in

prosecuting them. Many parts of these journals are to me very affecting, as, when recording his wretched health and often miserable sensations, during the struggle he was unremittingly making by all possible means to get rid of his ailments, "*Valde miserabilis!*" is not an unfrequent expression; and commonly accompanied with mention of diminished power of limbs and general feebleness, with pain and numbness of limbs. Sometimes he is in despair of recovery, and resigned to his fate; at other times indulging in hope, thankful for feeling better, and expressing thanks (and he does it very often) by the use of letters, as G. G. D., O. O. O., or G. O. O. D. There is consolation in witnessing this elasticity of mind, and the power of enjoyment also which he possessed in the exercise of its best faculties. In him, mind seemed to triumph over matter, and the mental part over the corporeal; and his own instance is one of the best I know in favour of the train of argument he was wont to maintain against the materialists, who hold organization to be all in all, and life and intelligence results merely of corporeal arrangement.

The natural strength of his mind, it appears to me, was very clearly manifested under these circumstances. Dependent entirely on his own resources; no friend to converse with; no one with him to rely on for aid, and in a foreign country, without even a medical adviser; destitute of all the amusements of society; without any of the comforts of home—month after month, he kept on his course, wandering from river to river, from one mountain lake and valley to another, in search of favourable climate; amusing himself with his gun and rod, when sufficiently strong to use them, with "*speranza*" for his rallying word.

But all this will better appear in the extracts which I shall give from his journals, and which, for the sake of brevity, I shall introduce as fragments.

From Ravenna he went by way of Gorizia to Laybach, in Illyria, where he arrived on the 19th of April.

“ *Gorizia, April 15.* — The country beautiful, in the first youth of the year, quite a garden cultivation round Gradisca and Gorizia; a good mode of cultivating the vine by training it from one pollard cherry-tree to another; the cherry-trees are so cut that a few perpendicular shoots for fruit remain.

“ The Isonzo of a beautiful pale azure, with slight milkiness. I could see no fish. This river from a subterraneous source, and rising in limestone.”

He remained at Laybach till the 23d of May, daily occupied in shooting and fishing in the adjoining rivers and marshes, in connection with the pursuit of natural history; and, in point of health, gaining rather than losing ground.

“ *Laybach, April 19.* — Ascertained by disagreeable experience that rivers which run from limestone rocks are not always clear. The Wipaco, which on Monday was beautifully clear, though large, became after the hard rain of a night milky, and I could not raise a fish; and they say it will be two or three days before it is clear again.

* * * * *

“ 24th. — Yesterday went to the Save, which on the 22d was small and blue; this day it was at least ten times as large, and quite foul, like the Drave in summer. This day went into the marshes in the boat; found one jokelta, which I killed, — a fine large one, which my chasseur says is a female.

The male, he says, is smaller and darker. Found a quail, which I likewise winged, and now keep alive to observe its habits.

* * * * *

“28th.—There are no eels, I am told, in any of *the rivers* that communicate with the Danube. The eels I saw here in the market were from Trieste. There are no eels in the Chernate See, or in any of these rivers. Is this owing to a want of the congers in the Black Sea, or to some great fall in the Danube, which they cannot pass?

* * * * *

“Saw two eagles, one of them very large, with a white tail, followed by a flock of crows. The weather is now become beautiful; the mountains, which last week seemed quite near, now appear at a great distance; the air is become dry.

“The quail, who was very quiet, has become very impatient, and pecks at the window constantly.

“29th.—Went to the fall of the Zeyer, a beautiful spot; fine wooded hills in the near view, and the bold and snow-clad mountains of Carniola and Carinthia beyond. The water beautifully clear and blue. Saw great quantities of fish showing themselves in the water, with bright sides, called here breet fish, or bred fish. Query, the Ida carp?

“They said there were hucho, grayling, and trout; but I caught nothing; and from the quantity of coarse fish, I doubt if it is ever a good fishing spot. But the day was as bright as the river, — sun without a cloud; and I was at the spot in the worst time of the day, between one and three; saw a very few flies, like the granam, but there was no rise of fish.

* * * * *

“ *May 2.* — Went to the Kaltenbrun, or Fall of the Lubiana. Saw some huchos rise at small fish, and put on my trolling tackle; was exceedingly unlucky: lost two sets of hooks, and at last hooked a large hucho, I think near two feet long. He played manfully, and fought for a long while in the great deep rapid below the bridge; there was no landing place. He was hooked with minnow tackle. I threw my rod into the water, which was recovered by my assistants, and I got him, fairly tired, to land; when my courier, in his haste to snatch him up, broke the hooks which held him, and let him slip into the water, where he finally escaped. I never saw such a piece of ill luck, after so many narrow escapes, before. I think he was above seven pounds, but fought with less energy than a salmon — much as a trout would do. He took a small roach.

“ The views were extremely beautiful, and the mountains appear in the ride round the Kaltenbrun rivalling those of Switzerland in grandeur, — the whole scene abounding in beauty.

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“ *6th.* — Temperature only 52° at six (N. W.) — rose above 62° in the middle of the day. Went to a small stream called Kleingraben, where I caught a grayling with a fly, and a hucho with a small fish: the hucho was about a pound, with black spots, a white belly, and very narrow compared to its length, about the ratio of six to thirteen, but thick. Dorsal radii, 11. Pectoral, 15. Ventral, 10. Anal, 11. Caudal, 20, or 21.

“ The huchos in this last stream have, probably, less food than in the Laybach river; for I hooked a small one with a fly, but this escaped; and I hooked

another larger one, probably more than two pounds, who likewise escaped with a small fish. These fish seem peculiarly fitted for the tributary streams of the Danube, which abound in coarse food for the hucho. A hucho would starve in most of our mountain rivers.

“ These huchos, this day, ran with great violence at the small fish, which were roach and dace; and yet the stream was a clear mountain stream, running over limestone. The guide says there are few or no trout in this stream, which is haunted by huchos and grayling; and the huchos are of all sizes. This seems to show that it is not a fish which goes to the sea after being born. The hucho I dissected this day was a male, but the melt very slightly developed, and it evidently would not spawn this season. Quere, is residence in the sea, or large river, or lake, necessary to give full development to the sexual organ, or is it a phenomenon dependent on age? The hucho seems a solitary fish.

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“ 7th. — Observed the difference between roof of *thatch* and of *slate*, after the rain. The rain poured in torrents from the slate, but less violently from the thatch; but the thatch *continued dripping* when the slate was quite dry. This offers a good analogy to drained, or rocky, or cultivated countries, and boggy or wild countries. The rivers in one case are rapid, and soon exhausted torrents; dry in summer. In the other, nearly perennial and equable streams.

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“ May not the hucho be originally of the sea, and have, in course of ages, changed its habits, but preserved the instinct of migrating from the larger to the smaller rivers to *breed*; and, probably in winter,

leave the Alpine torrents for the warmer and deeper streams of the Danube, and its tributary large feeders, the Drave, the Save, &c. ?

“ To examine if there be not varieties of these fish depending upon the waters, which they haunt, like salmon. The Hucho here has no spots on the fins ; but as yet I have closely examined no large one.

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“ 12th.—Wet day, thermometer 57°. Moist, thermometer 55°. I saw yesterday in the Laybach river the alder fly, and some few olive May-flies. Went in the rain up the river, and found a great number of rails. Shot in a very short beat nine rails and a quail, and chasseur one rail and one quail. My bag this day the best I have had — twelve. The dogs behaved well ; and the rails, though they ran hard, were most of them raised.

“ These meadows seem excellent for them ; there is much water ; they are now too grassy for jokelta ; but the short grass forms the haunt of the quails, and the long grass of the rails.

“ It would seem as if all the migrating animals moved onward till they found their proper places. First, common snipes come here ; then, when the grass is too long for them, jokelta ; and then rails. The jacks breed in the marsh, which no other birds except plovers haunt.

“ The male rail has a larger body and a darker throat, and more of blue feathers. One of the rails shot this day was with egg.

“ Thermometer at four, 63° ; rain over, but moist, thermometer 61° only. Weighed a male quail ; it was 1600 grains : and a male rail, the largest I believe of ten ; it was 2675, and larger than most of

the others by 3 or 400 grains. The sizes of the males and females not determinate. Some males larger than some females, and vice versâ. The male rail known by blue feathers in the throat, the female by the yellow.

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“ The rails now in great abundance, and likewise the quails. I have no doubt, if I were well and so disposed, I could kill thirty rails in a day and twenty quails.”

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We shall now follow him in his further wanderings through Upper Austria, Bavaria, and Switzerland, back to Illyria; wanderings in which he whiled away his time from the 23d of May, when, as already mentioned, he quitted Laybach, to the 11th of August, when he returned to it:—

“ *May 25.*—A disagreeable day’s journey to Gratz; hot and windy, with an oppressive air (sirocco), and the dust always before the carriage. Temperature at Gratz too high, and the air feels oppressively warm. Thermometer in my room window 64°. Remarked that the dogs (German) attack whoever does not stink of tobacco, it being characteristic either of a beggar or a stranger.

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“ 28th. *Eisenarz.*—A beautiful day. Passed some snow on the road, and found the temperature agreeable. The whole scene round this place fine: snow in spots on the mountains; but wood and rock enough to give variety. Comfortable inn. Thermometer in my room 56°; in the window, at nine, 52°; and as the night is clear, it will probably be much lower.

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" 29th. — Went to the Leopoldsteensee. Caught in the Reva, running out of this lake, four trout, one beautifully coloured like a char, except that the spots were vermilion. Struck this day by the extreme similarity of the char and ombre chevalier. A large char, got from the lake, was exactly like it in colour of flesh, and differed from it only by more pink on the belly. In my window at nine, thermometer 55° after a beautiful day.

" From the similarity of the char of the Leopoldsteiner Lake, and the ombre chevalier of the Lake of Borguet, I am induced to make some observations on the physical causes which, by changing the habits, in many generations may change the forms of fish. The trout, when it feeds principally on fish, must be extremely active and strong; and may, from its predatory and mobile habits, acquire large teeth, large fleshy fins, thick skin, and great pectoral fins for turning; when it feeds on shell-fish, it may gain the stomach of the char and its colours, as in the Gillaroo trout: and the char, when it becomes large, is extremely like, if not the same with, the ombre chevalier. The colour likewise varies with the water; in the clear water coming from this lake, and the Koenigsee, the trout are beautifully coloured, probably from the influence of light,—silvery white, with bright vermilion spots. I have seen the same differences in Cornwall at Castle a Denis, which are continued by generative impressions: two streams, one from a moor yellowish brown, producing black and yellow trout; one clear with a sandy bottom, producing white trout with red spots. There are in the Leopoldsteensee *lacts forelle*, large trout 18lbs. and

more, with silvery bellies and red flesh. Are these great char, or trout like those of the Lago di Garda?

“The habits of the spawning of fish must be influenced by weather; the char I got this morning with mature eggs was just about to spawn, yet in England they spawn in winter.

“30th.—A beautiful day, thermometer 58° at eight in room, and 60° in window; warm. I went in the carriage to the fall of the river that feeds the lake. The scenery very beautiful; fine woods, with lawns in the middle of them, and some spots of beech and oak. The river clear and cold. The trout lying at the bottom, and did not take any notice of the fly. I never saw a clearer stream; the intervals of grassy lawns covered with flowers; a beautiful species of dwarf sweet-smelling rhododendron. Fished again in the river running from the lake, but raised only one fish; no fly on the water. Is this owing to an approaching storm? Thermometer 65° in my window, and 66° as the storm began with rain and thunder.

“Ascertained that the char is not distinguished by colour as to sex, for of two pink fish one was male and the other female; and of two others almost as pale as the ombre chevalier, there was the same difference,—one male and the other female. It is now raining hard, yet the thermometer is rising, and is now nearly 67°. Is the vapour from the warm air, which has been rising all day, condensed, and coming down in rain, and bringing with it warm air? There is a perfect calmness; half past six. The scenery round the upper part of the lake very magnificent. Nature in her rudest dress, but not devoid of

beauty. Wood and rock predominant over snow; or even in the upper peaks it is only in patches.

“ Deo O. O. O. and H. A. and G. G.

“ 31st. *Eisenarz*. — Another beautiful day. Thermometer at four in window 54° ; bright blue sky, and the swallows soaring high, but not higher than yesterday in the storm, when the red light of evening, shining upon the rain clouding a mountain and a broken rainbow, gave a peculiar character to the view; one great peak in sunshine, others black from clouds and reflected shadow.

“ Went to the waterfalls by the mountain road; views very fine, and ascent and descent tremendous. Saw none of the Alpine animals, though there are said to be many chamois, and great gras. Returned to the river, and fished for half an hour, and caught with the black fly three trout, exactly like the burn trout of England, Ireland, and Norway. The day not so hot to my feelings as yesterday, — more wind; the thermometer under 65° at five in my room. The largest trout that I caught this day has ova developed like most of the char, but far from mature. I have seen no fish in which the ova were so mature as the char mentioned the 29th. After two appears to me the best time for fishing in these Alpine torrents; the water is then warmest, and the fish come to the surface.

“ At nine the thermometer, which had been from 65° to 63° till eight, had fallen to 60° ; a beautiful night, with a crescent moon and a blue sky. In the lake here I observed very large minnows; so that there are trout, char, and minnows.

“ June 1. *Eisenarz*. — A beautiful day for the journey to Admont. The road by Raffling very

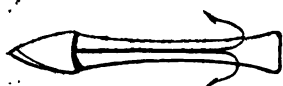
beautiful, but the mountains high, and I did not arrive at Admont till nine o'clock; was thirteen hours on the road, and three of them owing to accidents.

“2d. *Admont*. — Thermometer at 65° in the window in my room. The views very beautiful; but, alas! I cannot enjoy them. Though weak by evacuations, I have a headach, and I fear some congestion of blood in the brain; yet I have fasted and kept up constant excitement on the nape of the neck by acetic acid, and I have applied since I wrote three leeches to the temples, and behind the ear. Thermometer 67°. Here are stags, roes, and chamois surrounding this secluded residence, and for a strong and youthful lover of the chace and of nature it would be a delightful residence.”

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“4th. — Left Admont for Aussee, — a wet day. At Aussee almost cold: thermometer in window 54°. The river very full, and the high mountains all covered with snow. The dark clouds give a peculiarly fine effect to the scenery, and the abrupt, pale rock contrasted with the dark pines. It is a very striking place in wood, rock, lake, and river scenery.

“5th. — Rain in the morning, but cleared at eleven o'clock. Went to the river that runs out of the Edersee; very beautiful scenery. I caught ten trout, one about a pound, like the brook trout of England. The sabling lives here well in stews in the river. A fisherman of Aussee went with me. His flies had a hair-link too coarse; his mode of fishing with a minnow curious, and not bad, had his tackle been finer, — a loop of lead, two hooks; the lead



supplies the head, so that it is the drop minnow reversed. He caught two fish to my ten. Char spawn here in October; how different from Leopoldsteensee at Eisenarz! Fisherman uses ants' eggs on the hooks of his flies, and he says with success. — Quere, are they taken for cadis?

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“ 6th. *Aussee*. — Thermometer in window 56° at half past seven. Clouds hanging on the mountain. Went to the *Ödersee*, a beautiful small Alpine lake surrounded by pine woods and high mountains. In the lake, and the river which empties it, caught with a fly twenty-one trout, and three chubs; the trout brook trout, herring size or larger. How did the chub get into this high lake, where trout and sabling are the natural inhabitants?

“ The lake trout, even when half a pound, were red, like salmon; the river trout, white; yet the skin of the river trout was much brighter; taste equally good. The river trout must exert themselves more; does this exhaust their fat?

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“ 10th. — This evening admired the fine mountain scenery, which for the first time was distinct; the few clouds were below the summits of the mountains, white in the sun, and almost as white as the snows above them. The new-fallen snow is nearly melted; but large masses remain on all the tops of the mountains, and in the gullies.

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“ 11th. — Weather improved apparently at eight; but white clouds on the breasts of the mountains; gleams of sunshine; thermometer at 60° in window.

" This has been the finest day I have seen here, but the evening is becoming showery. All day it was fine, proving the truth of the evening rainbow, which was beautiful yesterday at eight P.M.

" I went to the Grundalsee, and made a piscatory voyage to the farthest lake, where the river enters from the other lake. Killed there nine fine trout, two about 2lbs. English or more, and in fine season. In the lower part of the lake took another, and three chub. Was rowed by the fisherman and his wife. Took a char from his stew, which was excellent,—nearly a pound. The scenery was very beautiful, and the lake so calm that the mountains were seen with their clothing in the lake, so that a reflected picture of them was below.

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" 12th.—Went to Alt Aussee, a beautiful Alpine lake; but could see no trout worth taking, as the fishery belongs to the peasants.

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" 13th.—Thermometer in room 60°. One leech to temple (four yesterday). Went to Oedersee; but the water was coloured from the rain of last night, and I caught nothing but chub. A disagreeable day; rain, with alternations of hot close sunshine. Returned at three of the clock, valde miserabilis! after trying the river a very little. I have not been so miserable since I was first attacked; whether it is the exhaustion of five leeches and purging, or whether there is some mischief brewing in the vessels of the brain, I know not; but, whatever my fate may be, I have nothing to reproach myself with, either in physical or moral discipline; and if I disappear like poor Raffles, voluntas est Dei op. om. I have been

less irritable, and have had nothing to annoy me,—good inn, honest and civil people, fine scenery, and now not bad weather, and yet I feel ill and oppressed; yet I have excited the nape of the neck, which discharges, and have now put a small blister on the left thigh.

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“14th. *Ischl*.—The road from Aussee beautiful, but temperature much increased; a day of bright and continual sunshine. Thermometer in the room here from 73° to 74°. The Traun of a beautiful green, rather paler than the Rhine. It is now very large, but clear.

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“15th.—Left *Ischl*. A thunder storm at five in the morning had fallen, and sent the roads into the Traun, which was quite foul between *Ischl* and *Abersee*. Took boat at *Abersee*, one post from *Ischl*, and came in two hours and a half to *Gmünden*. The views in the upper part of the lake very beautiful and wild, and the journey from *Ischl* abounding in picturesque views. The Traun falls out of the lake at *Gmünden*, green, and now very large, but beautifully clear. I fished below the town, and between six and half past seven I caught eight or ten trout, and grayling nearly in equal number. One trout was nearly three pounds, a beautiful fish,—black and red spots, and yellow belly. Two grayling were between a pound and a half and two pounds, and had the yellow belly so marked in Continental grayling. Temperature here 68° now in my room, at nine o'clock. It has been a cloudy day, with some threatening of rain, with some fulmen brutum.

“16th.—Bright sunshine. Thermometer in my

room 69°. Went to the fall of the Traun, which was very magnificent; rain came on in my return; the water was at least ten times as much as when I was there nine years ago, and the fall in consequence more magnificent, beautifully clear and green; the white foam and the green tint like those of the fall of the Rhine at Schaffhausen. Fished, but caught only one grayling. The water far too high, and the fish cannot see the fly from the bottom. From the bridge it is an immense rapid for at least a quarter of a mile. The pools where I caught my grayling nine years ago were parts of the great rapid."

The following little poem, descriptive of the Traun in its power, was written about this time:—

" ON THE FALL OF THE TRAUN.

" July 25. 1827.

" From the high rock thy lovely waters burst,
As if a new creation from the wand
Of Israel's mighty prophet, sprung to life
To save his people! But the dreamy thought
Of that most blessed, tho' but scanty rill,
Gives but faint image of thy might, and power,
And awful force, and fulness: as if a spirit
Imprison'd by magic art and now released,
Thou thunderest on, determined to destroy;
And thy mild functions to produce and cheer
Are changed for attributes more terrible,
Saddening, destructive, wildly carrying on
Rocks, trees, before thee, e'en the mighty pine,
Rending the mountain, through a new-torn vale,
Opening thyself a passage to the plain.
But in thy wayward and most perilous leaps
Thou still art pure, and still might image well
The innate mind of poet or of sage.
In thy bright azure depths, and when thy foam
Sinks into quietness, I seem to view
That season of our life when pleasure fades,
And sober reason with its heavenly light
Fills the deep cool of th' unimpassion'd mind,
Escaped from turbulent and fretful youth,

Its troubles, passions, bubbles, noise, and foam,
 Which are well imaged in the falling stream.
 E'en as I look upon thy mighty flood,
 Absorb'd in thought, it seems that I become
 A part of thee, and in thy thundering waves
 My thoughts are lost, and pass to future time,
 Seeking the infinite, and rolling on
 Towards the sea eternal and unbounded
 Of the all-powerful, omnipresent mind !"

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"June 18.—Rain all night. Thermometer 65° in room and in window. Went to the Traun, and fished below the bridge and at the mill. Had very good sport; a day with occasional clouds and rain, and gleams of warm sunshine. Hooked above the mill a very large trout, I think above four pounds, who got under a bank, and broke my fine *gut*, after some good play. Caught seven lache forelle, or lake trout, and they call them here see forelle, with green backs, black spots only, and belly of a beautiful silvery whiteness.

| | | | |
|----------------|---|---|-----------|
| " Pectoral fin | - | - | 13. |
| Dorsal | - | - | 12. |
| Anal | - | - | 12. |
| Ventral | - | - | 9. |
| Caudal | - | - | 20 or 22. |

"The largest of these fishes about three quarters of a pound. Caught two common trout very silvery, but with red spots; and two large grayling, one nearly two pounds.

"I have seen few finer fishing incidents than the one of this day. The large trout, who was lying off the edge of the foam of the fall, rose at the fly, and was slightly hooked only. I changed the fly, and

put on a larger one, and he took immediately, and dashed away into the rapid water, when he sprung high in the air. He then went to the bottom, and I unwisely suffered him to run, supposing he would go down the fall; instead of which he ran to the bank, and there felt his strength, and broke a slender stretching line. Went at ten, returned at three.

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“22d. *Voglabrück*.—A great thunder storm in the night, and the rain continues. Thermometer 88°.

“Went to the source of the Agger, that is, where it is poured out by the Kammersee, a fine sapphire (pale blue) stream, full of grayling. Whilst a thunder storm was brewing and falling I caught a vast many grayling; beautiful fish, with yellow bellies and sides, some a pound and a half. I caught so many that I cannot count them.

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“24th.—A fresh, beautiful morning, came on to Kammer, and fished till half past two from eleven. Had excellent sport; caught a number of great grayling, from one to two pounds. Caught one trout likewise. The Agger is beautifully clear and blue, and it is impossible to have finer fly-fishing; but it is almost satiating from its perfection, and from there being no difficulty of any kind, except what arises from my state of health.

“25th.—At six in my window 55°: a beautiful day. At three, thermometer in room 64°. Returned from a loitering day, in which I caught some grayling and a large bleak, almost as large as a herring; but fished without much energy, and chiefly experimentally, with salmon and large lake flies, with which I caught grayling. The Agger, I think, somewhat smaller, but now four times as large as the Avon, and

amongst the clearest streams I ever saw; as clear as the Lathkill or Traun.

“Went out again at six: a beautiful evening for fishing; calm; had excellent sport: caught ten or twelve great graylings, from two pounds to one pound, which I saw rise at the fly.

“26th.—Found a fire-fly in my room last night. Thermometer at half past seven in room 60°, in window 59°. Left Kammer for Mondsee, a journey commanding beautiful views of the Kammer see, for four or five miles along its banks; and after an inland journey of seven or eight miles, the road opens on Mondsee, which is likewise a beautiful lake.

“27th. *Mondsee*.—Thermometer in window at nine, 58°; cloudy, and a fresh-feeling day. It turned out a rainy morning. I went, however, to the river, and caught, principally with the May-fly, a number of small trouts, I should think forty, and four large grayling.

“A beautiful evening; the mountains illuminated above the lake by an unseen sun, and the western sky in a blaze of vermilion; light so bright succeeded by almost absolute darkness. My evening walk was to the hill above the town, from which the views are very beautiful.”

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From Salzburgh, where he went on the 30th, and remained part of the following day, he wrote a letter to Mr. Gilbert, part of which I shall insert, as it is descriptive of his state of health at that time; of the tempered manner in which he indulged the hope of recovery; his feelings towards the Royal Society and the cause of science; and of his motives for retiring from the office of President.

“ I am sorry to say that the expectations of my physicians of a complete and rapid recovery have not been realized. I have gained strength, under the most favourable circumstances, very slowly; and though I have had no new attack, and have regained to a certain extent the use of my limbs, yet the tendency of the system to accumulate blood in the head still continues, and I am obliged to counteract it by a most rigid vegetable diet, and by frequent bleedings with leeches and blisterings, which of course keep me very low. From my youth up to last year, I had suffered more or less from a slight hemorrhoidal affection; and the fulness of the vessels, there only a slight inconvenience, becomes a serious and dangerous evil in the head, to which it seems to have been transferred. I am far from despairing of an ultimate recovery; but it must be a work of time, and the vessels which have been over distended only very slowly regain their former dimensions and tone; and for my recovery, not only diet, and regimen, and physical discipline, but a freedom from anxiety, and from all business and all intellectual exertion, is absolutely required.

“ Under these circumstances, I feel it would be highly imprudent, and perhaps fatal for me to return, and to attempt to perform the official duties of President of the Royal Society; and as I had no other feeling for that high and honourable situation except the hope of being useful to society, so I would not keep it a moment without the security of being able to devote myself to the labour and attention it demands. I beg, therefore, you will be so good as to communicate my resignation to the Council and to the Society, at their first meeting in November after the long vacation, stating the circumstances of my

severe and long continued illness as the cause. At the same time, I beg you will express to them how truly grateful I feel for the high honour they have done me, in placing me in the chair for so many successive years. Assure them that I shall always take the same interest in the progress of the grand objects of the Society, and throughout the whole of my life endeavour to contribute to their advancement, and to the prosperity of the body.

“Should circumstances prevent me from sending, or you from receiving, any other communication from me before the autumn (for nothing is more uncertain than the post in Austria, as they take time to read the letters), I hope this, which I shall go to Bavaria to send, will reach you safe, and will be sufficient to settle the affair of resignation.

“It was my intention to have said nothing on the subject of my successor. I will support, by all the means in my power, the person that the leading members of the Society shall place in the chair; but I cannot resist an expression of satisfaction in the hope you held out, that an illustrious friend of the Society, — illustrious from his talents, his former situation; and, I may say, his late conduct, — is likely to be my successor.

“I wish my name to be in the next council, as I shall certainly return, *Deo volente*, before the end of the session, and I may, I think, be of use; and likewise because I hope it may be clearly understood that my feelings for the Society are as they always were, — those of warm attachment and respect.”

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“July 4. — Rain and lightning all night, and still

continues at eight. Thermometer fallen to 62° in window. Left Transtein on the Munich road; the Chiemsee and small lakes form beautiful pictures in the landscape: the Chiemsee bounded by high mountains, and surrounded by woods. Rained till one o'clock, and then were fine views of the mountains, with clouded intervals. Reached Aibling at four o'clock.

"7th. — Cool in the morning at eight. Thermometer 62° in window. Shall leave Munich for Starenberg on the lake. The journey to Starenberg not interesting, through large woods. Lake too low, and mountains too desolate.

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"8th. — Went to a small lake, Kochlsee, about six miles off. The scenery I think finer than any I have yet seen in Bavaria, except, perhaps, the Chiemsee. In returning caught some small trouts in a brook we crossed. The fisherman says there are huchos both in the lake and the large river which feeds it.

"9th. — Came on to Feussen; the road picturesque, especially the last eight or ten miles. Went to the fall of the Lech, a large river, tinted from melting snow. The fall not high, but the scenery surrounding it fine. Thermometer at six in window 65° .

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"11th. — Constant sunshine without a cloud. Came on to Bregenz. The views in descending to the town fine, and the mountains of the Tyrol and Appenzal very grand seen over the lake. Hot in the sun, in shade 76° ; and the thermometer, even in the night, above 70° .

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"12th.—Shall set out for Constance. Promise of a cloudy day. Thermometer 70° at seven. Passed the Rhine, a large turbid stream; rich country, abundance of vineyards, but nothing picturesque along the bank of the lake. Constance little worth seeing. The Rhine a grand river where it joins the two lakes. Went in a boat and fished, but saw nothing.

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"14th.—In the morning came on to Schaffhausen; bright sunshine, but not very hot. Thermometer in small room here 69° at half past two. Went in the evening to the fall of the Rhine, which was very grand,—fuller of water than when I was here twelve years ago. The rainbow beautiful. Fished in vain; but saw some men fishing, who took hase, carp, and chub. Did not see a fish of any size or interest rise, nor in the Rhine above the town. The fall, I think, may compare with that of the Gotha for size and effect; it is twice or thrice as large as that of the Traun, and I think about half the size of that of the Glommen. It is inferior to this last fall in height as well as in greatness, but its accompaniments and the colour of the water are much finer. I went down by the left bank, but the view is finer from the opposite side.

"The eels in the Lake of Constance must climb the fall, which I have no doubt they do, by wet moss and grass on the sides of the rocks. A *subterranean fall*, like that of the Rhone, they cannot climb. At Ballyshannon I have seen them in their progress; millions die, but millions likewise ascend.

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"15th.—Arrived at Zurich at one. The Limmat is beautifully clear, like the Agger in tint and size.

Nothing worth seeing in the road from Schaffhausen here."

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"17th. *Wesen, Wallenstadt Lake.* — A beautiful travelling day. The bottom of the lake very fine. The scenery in a dark but red sunset very sublime. This lake far the most magnificent I have seen in this journey.

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"18th. *Wesen.* — A rainy night and morning. Thermometer at 64° in room. Notwithstanding the rain, the views up the lake fine; the clouds passing over the dark rock and pine. This lake has more the character of a Styrian lake than any I have seen in Switzerland, and is like the Traunsee; but the river is not like the Traun: it is a whitish stream, and I have seen no fish in it.

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"Went to Glarus. The scenery upon a grand scale, with rocks extremely high, capped with snow. Like the scenery of Eisenharz in Styria, but I think upon a grander scale. Another beautiful sunset, with dark clouds hanging on the mountains, and the tops, clouds, and snow tinted with red or yellow light.

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"19th. *Ragas, on the Rhine.* — The road to Ragas very good and picturesque. The mountains peaked, and spotted with snow. The views here of the same character, very *Styrian* like; and the Rhine resembling the Einnrs.

"20th.—A bright morning; at five thermometer in room 60°. The peaks of the near mountains in bright sunshine. Passed the Rhine, and came on

to Felknis and to Bludenz. The scenery very beautiful; high mountains in some places display patches of snow; clear waters; and the Inn, a wild foaming torrent, clear but white: the peculiar, high-wooded mountains of the Tyrol in perfection."

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"21st. *Landeck, in the junction of the Rosana and the Inn.* — Arrived here from Bludenz at a little after five. The day was cloudy, and the latter part wet. I have never, I think, seen a finer road, or more romantic scenery. The sources of the Inn, beautifully clear, are visible all the first part of the road, and you soon ascend from the first post station to the snows, &c., which send down clear blue streams to the Inn. I never saw a finer effect than that produced by the wind and clouds, when we had passed the summit. It was like a rapid shifting of the most brilliant scenes; snowy capped summits shone forth in sunshine, and then were hid by a white cloud. Bright woods and the gushing cataract all came, as it were, living and moving upon the eye; the clouds sometimes seemed to fall like stones, and then to rise like balloons. These extraordinary phenomena ended in a thunder storm and rain; but even in the rain the scenery was very fine. The stream from the mountains nearly loses its clearness by foul companions, before it joins the Inn, which is like washerwoman's lees. Thermometer here $62\frac{1}{2}^{\circ}$.

"A fine sunset after the rain. Went after dinner along the magnificent road which goes to Balsano. The views very striking: high mountains, with the tops covered with new-fallen snow; the road above the Inn. The postmaster says there are grayling in

the Inn, and trout in the Rosana. These roads do great credit to the Austrian administration.

“ 22d. — Arrived at Nassereit a little after twelve. The road of the same imposing and sublime character. Mountains on each side capped with snow and breasted with clouds. Tempted by the appearance of a clear stream to stop here. Went at five o'clock to a small lake, the lowest of the three, which I remarked for the peculiar colour of the water twelve years and a half ago; it was of a bright grass green, though I think less green than at that time, as the pine wood is decayed and worked out. Saw no fish rise but just at the rapid, where the small river enters; saw a fish follow my fly from the rapid into the still water, where he took it. It was a char in good season of half a pound. Caught another fish, a small trout, in the little lake above, which was clear, but slightly milky; but fished in vain in the same place. This is the first char I have ever taken in angling. Thermometer in room 66° at nine, in window 63.

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“ 23d. — Arrived at Inspruck at three o'clock. The scenery in this part of the road not so fine as yesterday's. The valley of the Inn broader, and bounded by high mountains spotted with snow; a fine calm and bold outline; the valley very green; the Inn white and turbid. The rain is over; it is a close dark evening, rather oppressive to the feelings. The walks here fine, with the views of the snow-spotted mountains immediately above the town. Thermometer 63° in the room; at 60° in the window at nine.

“ 26th. *Steinach, two posts from Inspruck.* — Ar-

rived at twelve. Dined on ptarmagin, which was excellent. Slept here: the scenery very fine; deep valleys, with a foaming torrent, white from snow, and high mountains covered with snow in the distance; one entirely covered.

* * * * *

“ 31st. *Sillian*. — The course of the Drave is so changed by the winter floods, that it appears another river, and the fish seem to be all washed away. I have fished in all the places that seemed good, and have caught nothing.

“ This place is in Puster Thal, which finishes at Lienz and begins at Brixen; and is certainly one of the grandest valleys in Europe.

* * * * *

“ *August 1. Greifenburg*. — The scenery between Lienz and this place very beautiful; high mountains, apparently limestone, rising above the Drave; and extremely lofty spruce firs on the left bank; the view from Greifenburg *very* beautiful; a pyramid of rock opposite, with snow in its crevices. Thermometer in closed room here 72°; in window 80°.

“ It is, I think, the hottest day I have felt; but I have confined myself to the room, with windows and jealousies closed.

* * * * *

“ 3d. — Came to Wurzen. Arrived at twelve. A beautiful day, and the views from Vallach along this high mountain-road very glorious. The clouds of the whitest tints, lighted up by the orient sun, filled the valleys of the Gurlen and Drave, and the mountains rose above them into the bright blue sky. The road is through forests of beech trees and spruce firs, and the mountains on the Italian side occasionally

appear crested with snow in ascending: but it is in descending that these mountains open upon the view in their greatness. They present the noblest forms calcareous rocks can assume, and a great variety of colours; and they rise above beautiful green valleys (and high-wooded mountains), breasted with snow, and presenting their inaccessible summits to half the sky. I know no scene more sublime than this crest of the Carnean or Noric Alps; and there are no streams more beautiful than the two that originate from it,—the Sava and the Isonzo. Temperature about 70° in mid-day, but not oppressive to the feelings.

* * * * *

“ 5th. *Villach*. — Returned after a ride to a lake about two hours off. The road to the lakes below the Manhart (there are two) is very dangerous, but very picturesque; and I have seldom seen a scene of more savage and peculiar wildness. The lake is a clear blue shallow water, a sapphire set in silver, for the mountains are white; and the lake is called *Weissanfels*. Saw some trout in the lake, and minnows; the trout would not take the fly. In returning, the dog found some quails, and I shot three. Thermometer at two 70° . Went to the marsh, but found no ducks.

“ There was a beautiful rainbow at seven, and yet, August 6., it rained and thundered all night, and is still raining. At seven the thermometer 62° . Came on to Crainburgh; it rained all day, with more thunder and lightning. Here, in window, thermometer is 66° ; and there is another evening rainbow. Does the proverb only apply to England?

“ The scenery in the upper part of the valley of the

Kraimer Save is very beautiful: dark rock, with large masses of snow in all the hollows, and fine wooded hills below.

“*Since the rainbow appeared, it has lightened and thundered, and rained, almost without intermission. The thermometer now, at eight o’clock, is below 60° in the west window.*”

On the 7th of August he arrived at Laybach, and on the 18th he decided on leaving it, in consequence of two or three attacks of a bilious kind which he experienced. He thus notices the most severe, which occurred on the 13th:—

“A bilious attack came on last night, and has left me extremely weak, with a pulse at 110, which I have not had for many months. I feel extremely ill, and doubt if I shall recover. I feel as if my heart was affected. Is not this bilious attack generis *Rafflesii*?”

On the 15th he writes, —

“The night and the day are alike cloudless; and if in health and spirits, I should enjoy these glorious mountains; but I have a furred tongue, and a pulse at 96. I have applied a blister to the nape of my neck, and leeches to the temple. I know not what my fate will be; but yesterday I was particularly abstemious, and to-day I shall scarcely eat anything except broth.”

On the 18th he thus writes from Assling:—

“Resolved to leave Laybach; pulse 85 or 86, and extremely weak; slept ill,—and at seven set out for Assling. Have never felt so ill since I began my journey.” He adds,—“I must change the system; for I feel I cannot bear this exhausting plan, and if I

continue it I shall die of debility." He continues : —
" At five pulse rather mended, — 80 ; and the journey seems to have done me so far good. I admired, though we had thunder and a violent storm, the magnificence of the valley of the Save, which was this day in great beauty."

I shall insert a few more extracts from his journal of his homeward journey, which, like the preceding, may help to show in part how he passed his time, the fluctuating state of his health, and his unceasing enjoyment of the beauties of nature. In the expression of the latter there may be some repetition; yet were I to judge from the pleasure his brief notices of scenery have afforded me in reading them and selecting them, I would hope they may afford pleasure to others, although more happily situated than in the antipodes of such scenes,—as in Malta, where I now write, in the hottest season of the year; the sky unclouded, the earth parched, and where even the recollection of cool and gushing streams, and snow-capped peaks and green valleys, gives a kind of refreshment and enjoyment.

" 19th. — Arrived at Wurzen. A bright sunny day and very warm. Thermometer at twelve in room 66°; out of doors 76°, and moist one 66°: appearances of tongue and pulse improve; pulse only 72 to 78.

" The Save, notwithstanding the storm of yesterday, was beautifully clear, and the colour of Scotch topaz, that is, bluer than sea-green. The mountains are in great beauty: on the highest peak, which was almost covered with snow, black narrow clouds were rising, as if from a volcano, and in the sunshine be-

coming first white and then melting away. I think this valley, from Laybach to Wurzen, the most beautiful I have seen in Europe.

* * * * *

“ 21st. *Wurzen*.—It was a delightful breezy morning, with clouds; I went out on horseback, and beat some fields, and enjoyed the mountain view, and felt grateful to the O. E. I. for the improvement in my health. Rode till one, and shot tolerably; three rails, and two quails. The mountains were in great beauty. My pulse after my ride and exercise this morning only 72, and my tongue cleaner than I have seen it for a long time. Took a ride at six to the opening of the glen below where another stream joins the Sava; a glorious valley. Fished before without any success in the lake and river; there was no fly on, and a distant thunder storm kept down the fish. Pulse at nine this evening 62.—G. D. O.

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“ 27th.—Went after dinner in the boat round the top of the lake, but I did not find a single duck. Admired the Sorgente Sava; a number of deep circular holes with air bubbling through them, and large jets of water, which is beautifully clear. It seems to rise through mud; but there is no appearance of sand, and no turbidness. No plants grow in this place; and there are no fish near it.

* * * * *

“ 30th.—Examined this evening the air disengaged in such large quantities where the Sava rises. It appeared to me to possess all the characters of *common air*; was not absorbable by water, and supported flame in the same manner as common air.

“ 31st.—A wet morning. Resolved to pursue my

journey to Baden, as my spirits cannot bear this constant solitude, where there is no amusement and no books. Pulse not worse ; 70°.

“ Sept. 2. *Grieffenburg*.—These three thoughts occurred to me last night : —

“ 1. The river, like human life, has its origin from *infinity* (that of air), and is lost in immensity (that of ocean).

“ 2. May not all the phenomena of life be the results of a single organisation ? that is, may not the organisation of the two first beings have produced all the phenomena, moral and physical, belonging to their infinity of descendants all dependent upon one law, without any interference afterwards ?

“ 3. The Dutch burgomaster, whose ideas were so limited that in a time of a famine he proposed to prevent a future one, by converting a part of the park at Amsterdam into a potato garden.

“ Came on to Lienz. The clouds disappeared about one o'clock, and I never saw a more beautiful evening ; the zodiacal light was quite brilliant, and the mountains all uncovered. The scenery about this place rivals that of Wurzen.

“ Went out in the carriage, and had excellent sport ; shot well all day ; missed only the first shot, which was too far off ; and afterwards shot three rails, eight quails, and one snipe. I took my exercise well, with less fatigue, and certainly feel better. Offered up my thanksgivings to the O. O. O., with tears of gratitude and feelings of intense adoration.

* * * * *

“ Sept. 4.—A beautiful evening, with a full moon, and the mountains lighted by a gorgeous setting sun. Took a long walk, and my pulse on my return was

not more than 71 or 72. Saw this morning, in my walk, boys fishing in the Ischl; one had a grasshopper on the bottom hook, with lead above, and two artificial flies two feet and three feet above the lead, on coarse hair link. He had taken a small grayling. Thermometer at half past seven in window 50°. Thermometer twenty minutes before nine in window 50. A bright and beautiful night. The Ischl is rolling a flood of light under the full moon, and the snows are distinct on the mountains in the moonbeams.



* * * * *

“9th.—At Brenner, where I came this evening, the thermometer in the room was only 53°, and in the window 44°. I was only two hours in the morning in coming from Sterzing to Brenner. The scenery struck me as very fine, and more than when I saw it last in going down; more, I think, than in any of my former journeys, and this is my fourth time of passing it. The views on the snowy mountains on the right hand going up are very grand, and the distances well preserved; that is, a succession of mountains, which appear very distinctly one behind the other, with rocks, with pine woods, and in the back of all the snowy peaks.

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“11th.—Arrived at Nassereit at four o’clock. The scenery appeared to be grander in coming up than going down. At five o’clock the thermometer outside of the window is 72°, and the moist one only 55°. The autumnal migration of birds seems more dependent upon the want of food than upon temper-

ature. The quails remain till all the food is taken off the ground. But in Italy, as many as can feed in the stubbles stay all the year; and in Ireland, I doubt if they ever migrate to the Continent. The landrail, which feeds on worms and flies, certainly does. A curious subject is the connection of the habits of birds with the growth of particular plants. The quail seems to fix his abode where he finds *small* seeds; the rail in moist meadows, where snails, grasshoppers, and other flies and worms abound, and he eats with them the seeds of grasses.

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“ 13th.—Left Nassereit for Reitte, a magnificent road, with the little lakes sparkling like emeralds in their pine-covered basins; but the waters in all of them appear this day equally green, and many fish were sporting in them. Bought a female gelinotte and a ptarmigan: the foot of the gelinotte is curious, from the scales and protuberances which occupy the place of feathers, and which must be almost as bad conductors of heat; at the same time, they are better fitted for a bird that lives principally in thick woods, and perches on small branches, as they give prehensile power to the feet.

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“ 14th.—The scenery round Reitte fine, and the pass through the mountains to Füssen a grand Alpine valley. The woods are now in great beauty; their autumnal tints developing; and the Lech is of a clouded blue, and much clearer than in July. From Füssen to Kempten little worth seeing. We pass the Weissensee, a lake in which it is said the mirror carp is found. This lake is not large, and there is nothing

interesting in the views to a tourist coming from the valleys of the Drave, Save, Inn, and Salza.

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“ 15th. — Came to Ulm. The only thing worth notice on the road was the quantity of hops round Menningen, which appeared to me higher than any I have seen: some of the poles, with hops rising to their summits, twenty feet high. The Danube is clear; and I saw some fish, I suppose coarse ones, rise in it. The environs of Ulm I think rather pretty, with gardens rising above the walls.

* * * * *

18th. *Plochingen*. — A bright morning. I intend to go back to my *grayling fishing*, which I might have enjoyed in coming down, had I trusted my eyes, and not what was said. Fished at Guitenger, in the water above the town. The scenery is very pretty; rock and woods, and a wild narrow glen, with a small trout stream about the size of the Chenis water. There are few grayling; none above the town in this water, the Rosach; they are principally found in the Vils, a mile lower down. I caught in an evening's fishing, between four and six o'clock, I dare say from forty to sixty fish; none of them above three quarters from that to a quarter of a pound; many ten inches or eleven inches long: all trout.

“ I do not know when I have felt more my paralytic symptoms, whether owing to more exercise, or to some other cause; but I feel as if a ligature was bound along the course of the arm and thigh. Perhaps I have walked more continuously than in shooting.

“ 19th. — A fresh morning; some light clouds. It is my intention this morning to try for grayling

in the Vils. Left Guitenger, and stopped with the carriage at Allenstadt, where the Vils joins the Rosach, a stream like the Teme in summer, and containing close to the town plenty of grayling and trout. I took the fisherman with me, and soon filled a *fish barrel*, and threw in numbers. I dare say, that in three pools, in less than an hour, I caught fifty fish, nearly an equal number of grayling and trout, but none much more than half a pound, like the last year's grayling of the Teme. They rose at a dark fly, and I took them *all* with one fly.

"It became cloudy whilst I was fishing, though it was bright till ten minutes before I left off, and it gradually became darker after twelve o'clock, and at three ended in a thunderstorm, and the rain accompanied me to Stutgard at half past four. The Necker was muddy; ere I passed by, its clear tint became red. Vine cultivation, and Indian corn, and rather pretty hills along the road; but the finest part is about Geislenger. There the trout and the grayling stream, and the wild rocks, give an interest to the scene, even to one who is not an angler.

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"21st. — A bright fine morning at Carlsruhe. Passed a disagreeable night, with symptoms of indigestion so violent that I feared at first they were apoplectic. I regret the quiet and beauty of the Tyrol and the Illyrian provinces; and if I had medical advice, would return to them immediately. These inns and people seem made to *form* invalids. I had two peasants swearing, and smoking, and snoring, in the next room to mine, who scarcely allowed me to sleep, and woke me before daylight."

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" 22d. *Baden*.—A fine day ; but whether loitering disagrees with me, or from what other cause, I am, valde miserabilis, worse as to sensations than since I have left Laybach. The scenery in the beginning of its autumnal tints is very beautiful, and for a person well or becoming convalescent it would be a beautiful place, and an agreeable residence : but I fear my light of life is burnt out, and that there remains nothing but stink, and smoke, and dying snuff.

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" 25th. *Spiers*. — Decidedly worse ; applied sixteen leeches and a blister to the nape of the neck. Decidedly worse, and have decided to go home immediately ;—the old pain, and more severe in the region of the heart ; yet I ate yesterday only the breast of a partridge, with a little pike ; to-day have eaten only a little chicken broth, and shall fast for two or three days ; pulse nearly 100.

* * * * *

" 27th. *St. Goar*. — A very beautiful and glorious evening. I thought I was going to be quite well, as the weakness of the left wrist, which put an end to my shooting at Spiers, is quite gone ; but I found my stiff leg as bad as ever. Yet I can hardly be lower, or live lower. —Dubito fortissime restaurationem meum.

" As I have so often alluded to the possibility of my dying suddenly, I think it right to mention that I am too intense a believer in the Supreme Intelligence, and have too strong a faith in the optimism of the system of the universe, ever to accelerate my dissolution. The laurel water, therefore, which I have carried about with me, and used constantly, and

from which I have decidedly derived benefit, is a prescription of Tomasini's; and the laudanum and opium which are in my dressing-case, but which *I have never used*, were recommended to me in small doses to remove irritation, taken with purgatives. I have been, and am, taking a care of my health which I fear it is not worth; but which, hoping it may please Providence to preserve me for wise purposes, I think my *duty*.—G. O. O. O.

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“Walked for an hour this evening in the moonlight; probably, with constant use, my leg and arm will be restored. I think I decidedly gain ground.”

In this precarious state of health, and often wretched state of feeling connected with it, he pursued his journey to England, where he landed the 6th of October. That night he slept at Canterbury, on his way from Dover to London, and the following day he arrived at his house in Park Street.

He remained in England till the last week of the following March; and, in relation to health, was neither better decidedly nor worse. He continued in the same fluctuating state, occasionally indulging in sanguine hope of recovery, and most willingly trying new modes of treatment; occasionally almost in despair of amendment, yet still struggling on, and making head manfully against his infirmities. Unable to enter into London society, or follow actively the pursuits of science, he proposed soon after his return taking up his residence in the country, and he probably would have done so, could he have found at that time a place to be sold or let which accorded with his views as to climate, and scenery, and field and river sports. Whilst in quest of such a spot, he

paid two visits, the only ones he made during his stay in England ; one to a nobleman in Sussex, for whom he had a great regard, at whose house he was taken ill the preceding year ; the other in Somersetshire, to his old and respected and much-loved friend Mr. Poole, with whom in November and December he spent about six weeks, with as much pleasure as he was capable of enjoying.

His occupations and amusements, at all periods of his life, were nearly identical, and so they were now. We have seen with what zeal he followed shooting and fishing on the Continent, whenever circumstances admitted of his engaging in either, and how deeply he was interested in several branches of natural history. At this season, when the angler's rod was useless, and he found himself hardly equal to the exertion which shooting requires, he sought refuge from ennui in composing his little work on angling, already more than once referred to and quoted, which he called "Salmonia," or "Days of Fly-fishing." It was written somewhat on the plan of his favourite author, Isaac Walton's "Complete Angler," or "Contemplative Man's Recreation ;" being in the form of dialogue, and discursive, relating principally (as the title, signifies) to the chief objects of the angler's art, the different species of the genus salmo. But it was not confined to them ; it included many particulars of their history and habits, and of the most distinguished fishing rivers in Europe ; and branched out into various other interesting topics naturally connected with the main subject, as is indicated by the persons of the dialogue. These are, as noticed in the preface, HALIEUS, who is supposed to be an accomplished fly-fisher ; ORNITHER, who is to be regarded

as a gentleman generally fond of the sports of the field, though not a finished master of the art of angling; POIETES, who is to be considered as an enthusiastic lover of nature, and partially acquainted with the mysteries of fly-fishing; and PHYSICUS, who is described uninitiated as an angler, but a person fond of inquiries in natural history and philosophy." It is added, "These personages are of course imaginary, though the sentiments attributed to them the author may sometimes have gained from recollections of real conversations with friends, from whose society much of the happiness of his early life has been derived; and in the portrait of the character of HALIEUS, given in the last dialogue, a likeness, he thinks, will not fail to be recognised to that of the character of a most estimable physician, ardently beloved by his friends, and esteemed and venerated by the public."

This excellent man was Dr. Babington,—alas! now no more. In my brother's sketches of characters, he is described with the same feeling and truth as prompted the above notice.

"*Babington*, the best and warmest hearted friend, the kindest husband and father, and perhaps the most disinterested physician of his time; with good talents, and a fine tact, and a *benevolence* which created sympathy for him wherever he appeared, and I believe often cured his patients."

The extracts already given from his journals of travels will afford some idea of his fitness for the undertaking, and of the amusement which he might derive from the recalling of old scenes of enjoyment, and the memory of pleasures passed away. From his boyhood, we have seen, he had been a lover of

the angle, and he was hardly less fond of fowling, for which sport also he had acquired a taste early in life. At no time of his life did he relinquish angling, except at the commencement of his public career, whilst he was at Clifton, and the first year or two he was in London, when all his faculties were strained in the pursuits of science, under the impulse of a lofty ambition, and an intense desire which he possessed of distinguishing himself, extending the boundaries of human knowledge, and benefiting mankind. When he resumed angling, he pursued it, I may say, passionately for some years, and never used his gun. The time, however, arrived, I think it was soon after his marriage, that he seemed to prefer his gun to his rod; and probably the reason for this was that he was much in the country in the autumn, and followed fishing and shooting more than formerly for amusement, and less as a mere relaxation from his scientific labours. Latterly, it is difficult to say which he preferred; the preference, I believe, was very much decided by the *kind* of sport; the *salmo trutta* of the branches of the Danube, in Southern Austria, and the double snipe in the marshes of Rome and Ravenna, Laybach and Altona, would be to him almost equally attractive. By connecting both sports with natural history, he gave them a degree of importance and interest not their own, and made them, as it were, rational. His note books show this very remarkably; they contain not merely the minutes of his day's sport, but also the results of his observations for the purposes of distinguishing species and identifying them, and of ascertaining their routes in migration, their peculiar diets and habits, of which an imperfect notion only can be obtained from the

extracts brought forward. He was a better angler than he was a fowler; indeed, he was the most successful angler I ever knew. He threw the fly with great delicacy and dexterity, and had a tact and knowledge which made him very superior to the common angler, however much practised. Salmon fishing he was very successful in; but, I believe, he was most successful in trout fishing, in which he had most experience. His tackle was curious and elaborate; he seems to have had a pleasure in collecting the gay materials necessary for dressing flies, though he seldom used them himself, excepting on emergency, having been always too much occupied to have had leisure to apply himself much to fly-making, an art in which it is impossible to attain tolerable skill without much practice.

I am sorry I have not a portrait of him in his best days in his angler's attire. It was not unoriginal, and considerably picturesque — a white low-crowned hat with a broad brim; its under surface green, as a protection from the sun, garnished, after a few hours' fishing, with various flies of which trial had been made, as was usually the case; a jacket either grey or green, single-breasted, furnished with numerous large and small pockets for holding his angling gear; high boots, water-proof, for wading, or more commonly laced shoes; and breeches and gaiters, with caps to the knees made of old hat, for the purpose of defence in kneeling by the river side, when he wished to approach near without being seen by the fish: such was his attire, with rod in hand, and pannier on back, if not followed by a servant, as he commonly was, carrying the latter, and a landing net. In fishing, as well as in everything else which he undertook, he

displayed extraordinary zeal and energy. It was not unusual for him to go two or three hundred miles for a day's fishing, and his perseverance was in the same proportion. I remember fishing with him from early dawn to twilight in the river Awe in June, for salmon, with little interruption, without raising a fish. Passionately fond of the beauties of nature, which he felt as a poet and saw as a philosopher, probably the happiest hours of his life were spent by the river or lake side, or on the mountain moor. In the open air, in the country, at any season of the year, but more especially in spring and autumn, when in tolerable health, he could always (and sometimes even when labouring under disease), throw off his cares, and rid his mind of all annoying thoughts. There he recovered the hilarity natural to his disposition, and appeared in his true character, most cheerful, amiable, and entertaining, and the delight of his friends. They, indeed, I will now say, were almost his only true friends who were his associates in these sports; and they perhaps were almost the only persons who knew him thoroughly and truly. But it is time to quit this digression, and return to the subject which led me into it,—“*Salmonia, or Days of Fly Fishing.*” Perhaps never was a work more characteristic of the mind and pursuits of its author; in fact, it is little more than the most interesting parts of his journal dramatised, on the foundation of his general experience in angling and the sports of the field, and his researches in natural history and science, diversified and enriched by thoughts and reflections rising from nature to nature's God,—from the beauties and admirable contrivances of creation to the wisdom and goodness of the Creator. I have turned to the book to give a few quotations in

illustration, and a very few will suffice. The first I opened upon relates to the swallow, and is an example of the poetry of the work.

“*Hal.*—Whilst we have been conversing, the May-flies, which were in such quantities, have become much fewer; and I believe the reason is, they have been greatly diminished by the flocks of swallows which everywhere pursue them. I have seen a single swallow take four in less than a quarter of a minute that were descending to the water.

“*Poiet.*—I delight in this living landscape! The swallow is one of my favourite birds, and a rival of the nightingale, for he cheers my sense of seeing as much as the other does my sense of hearing. He is the glad prophet of the year, the harbinger of the best season; he lives a life of enjoyment amongst the loveliest forms of nature; winter is unknown to him; and he leaves the green meadows of England in autumn for the myrtle and orange groves of Italy, and for the palms of Africa. He has always objects of pursuit, and his success is secure. Even the beings selected for his prey are poetical, beautiful, and transient. The ephemeræ are saved by his means from a slow and lingering death in the evening, and killed in a moment, when they have known nothing of life but pleasure. He is the constant destroyer of insects, the friend of man, and, with the stork and the ibis, may be regarded as a sacred bird. His instinct, which gives him his appointed seasons, and teaches him always when and where to move, may be regarded as flowing from a Divine source; and he belongs to the oracles of nature, which speak the awful and intelligible language of a present Deity.”

As an instance of description of scenery, may be

introduced the opening of the fourth day in the West Highlands, in which the incident, as a heightening one of wild nature, of the eagles teaching their young to fly, is related.

“ *Poiet.* — I begin to be tired. — This is really a long day’s journey; and these last ten miles through bogs, with no other view than that of mountains half hid in mists, and brown waters that can hardly be called lakes, and with no other trees than a few stunted birches, that look so little alive that they might be supposed immediately descended from the bog-wood every where scattered beneath our feet, have rendered it extremely tedious. This is the most barren part of one of the most desolate countries I have ever passed through in Europe; and though the inn at Strathgarve is tolerable, that of Auchnasheen is certainly the worst I have ever seen, and I hope the worst I shall ever see. We ought to have good amusement at Pool Ewe, to compensate for this uncomfortable day’s journey.

“ *Hal.* — I trust we shall have sport, as far as salmon and sea trout can furnish sport. But the difficulties of our journey are almost over. See Loch Maree is stretched at our feet, and a good boat with four oars will carry us in four or five hours to our fishing ground, — a time that will not be misspent; for this lake is not devoid of beautiful and even grand scenery.

“ *Poiet.* — The scenery begins to improve, and that cloud-breasted mountain on the left is of the best character of Scotch mountains; these woods, likewise, are respectable for this northern country. I think I see islands also in the distance, and the quantity of cloud always gives effect to this kind of view;

and perhaps without such assistance to the imagination there would be nothing even approaching to the sublime in these countries ; but cloud and mist, by creating obscurity, and offering a substitute for greatness and distance, give something of an Alpine and majestic character to this region.

“ *Orn.* — As we are now fixed in our places in the boat, you will surely put out a rod or two with a set of flies, or try the tail of the par for a large trout or salmon ; our fishing will not hinder our progress.

“ *Hal.* — In most other lakes I should do so ; here I have often tried the experiment, but never with success. This lake is extremely deep, and there are very few fish which haunt it generally, except char ; and salmon seldom rest but in particular parts along the shore, which we shall not touch. Our voyage will be a picturesque rather than an angling one. I see we shall have little occasion for the oars, for a strong breeze is rising, and blowing directly down the lake. We shall be in it in a minute. Hoist the sails ! on we go ! We shall make our voyage in half the number of hours I had calculated upon ; and I hope to catch a salmon in time for dinner.

“ *Poiet.* — The scenery improves as we advance nearer the lower parts of the lake. The mountains become higher, and that small island or peninsula presents a bold craggy outline ; and the birch wood below it, and the pines above, form a scene somewhat Alpine in character. But what is that large bird soaring above the pointed rock towards the end of the lake ? Surely it is an eagle !

“ *Hal.* — You are right ; it is an eagle, and of a rare and peculiar species — the grey or silver eagle ; a noble bird ! From the size of the animal, it must be

the female, and her aëry is that high rock. I dare say the male is not far off.

“ *Phys.* — I think I see another bird of a smaller size, perched on the rock below, which is similar in form.

“ *Hal.* — You do; it is the consort of that beautiful and powerful bird, and I have no doubt their young ones are near at hand.

“ *Poiet.* — Look at the bird! How she dashes into the water, falling like a rock, and raising a column of spray. She has dropped from a great height, and now she rises again into the air: what an extraordinary sight!

“ *Hal.* — She is pursuing her prey, and is one of our fraternity,—a catcher of fish. She has missed her quarry this time, and has soared further down towards the river, to fall again from a great height. There! you see her rise with a fish in her talons.

“ *Poiet.* — She gives an interest to this scene which I hardly expected to have found. Pray are there many of these animals in this country?

“ *Hal.* — Of this species I have seen but these two, and I believe the young ones migrate as soon as they can provide for themselves; for this solitary bird requires a large space to move and feed in, and does not allow its offspring to partake its reign, or to live near it. Of other species of the eagle there are some in different parts of the mountains, particularly of the osprey, and of the great fishing or brown eagle. I once saw a very fine and interesting sight above one of the crags of Ben Weevis, near Strathgarve, as I was going on the 20th of August in pursuit of black game. Two parent eagles were teaching their

offspring, two young birds, the manœuvres of flight. They began by rising from the top of a mountain, in the eye of the sun (it was about mid-day, and bright for this climate). They at first made small circles, and the young birds imitated them; they paused on their wings, waiting till they had made their first flight, and then took a second and larger gyration, always rising towards the sun, and enlarging their circle of flight so as to make a gradually extending spiral. The young ones still slowly followed, apparently flying better as they mounted; and they continued this sublime kind of exercise, always rising, till they became mere points in the air, and the young ones were lost, and afterwards their parents, to our aching sight."

I shall give only one quotation more, as a specimen of the manner in which he blended discussions of interesting points of natural history with his favourite art; and as it relates to a most interesting subject, — the instincts of animals, — I shall give it without curtailment, with the important application which is made from it to religious belief: —

"*Poiet.* — You transiently referred, Halieus, yesterday, to that instinct of salmons which induces them to run up rivers from the sea on the approach of rain. You have had so many opportunities of attending to the instincts of the inferior animals, that I should be very glad to hear your opinion on that very curious subject, — the nature and development of instincts in general.

"*Hal.* — You must remember that in the conversation to which you allude, I avoided even to pretend to define the nature of instinct; but I shall

willingly discuss the subject ; and I expect from yourself, Ornithologist, and Physicist, more light thrown upon it than I can hope to bestow.

“ *Orn.* — I believe we have each a particular view on this matter. In discussion we may enlighten and correct each other. For myself, I consider instincts merely as results of organisation, — a part of the machinery of organised forms. Man is so constituted that his muscles acquire their power by habit ; their motions are at first automatic, and become voluntary by associations, so that a child must learn to walk as he learns to swim or write ; but in the colt or chicken, the limbs are formed with the powers of motion ; and these animals walk as soon as they have quitted the womb or the egg.

“ *Phys.* — I believe it possible that they may have acquired these powers of motion in the embryo state ; and I think I have observed that birds learn to fly, and acquire the use of their wings, by continued efforts, in the same manner as a child does that of his limbs.

“ *Orn.* — I cannot agree with you ; the legs of the foetus are folded up in the womb of the mare ; and neither the colt nor the chicken can ever have performed in the embryo state any motion of their legs, similar to those which they have perfectly at their command when born. Young birds cannot fly as soon as they are hatched, because they have no wing feathers ; but as soon as these are developed, and even before they are perfectly strong, they use their wings, fly, and quit their nests without any education from their parents. Compare a young quail when a few days old with a child of as many months : he flies, runs, seeks his food, avoids danger, and obeys

the call of his mother ; whilst a child is perfectly helpless, and can perform few voluntary motions ; has barely learnt to grasp, and can neither stand nor walk. But to see the most perfect instance of instinct, as contrasted with acquired knowledge, look at common domestic poultry : as soon as they are excluded from the egg they run round their mother, nestle in her feathers, and obey her call without education ; she leads them to some spot where there is soft earth or dung, and instantly begins scratching with her feet ; the chickens watch her motions with the utmost attention ; if an earthworm or larva is turned up, they instantly seize and devour it ; but they avoid eating sticks, grass, or straws ; and though the hen shows them the example of picking up grain, they do not imitate her in this respect, but for some days prefer ants, or the larvæ of ants, to a barley-corn. They may have heard the cluck of their mother in the egg ; and having felt the warmth of her feathers agreeable, you may consider, *Physicus*, their collecting under her wings, and obeying her call, as an acquired habit. But I will mention another circumstance, where habit or education is entirely out of the question. Does the mother see the shadow of a kite on the ground, or hear his scream in the air, she instantly utters a shrill suppressed cry ; the chickens, though born that day, and searching round her with glee and animation for the food which her feet were providing for them, instantly appear as if thunderstruck ; those close to her crouch down, and hide themselves in the straw ; those further off, without moving from the place, remain prostrate ; the hen looks upward with a watchful eye ; nor do they resume their feeding till they have been called again by

the cluck of their mother, and warned that the danger is over.

“*Phys.* — I certainly cannot explain the acquaintance of the little animals with the note of alarm of the mother, except upon the principle you have adopted, and I fairly own that their selection of animal food appears likewise instinctive; yet it is possible that this selection may depend upon some analogy between the smell of these animal matters and the yolk which was for a long time their food in the egg.

“*Orn.*—I find I must multiply examples. Examine young ducks which have been hatched under a hen; they no sooner quit the shell than they fly to their natural element, the water, in spite of the great anxiety and terror of their foster parent, who in vain repeats that sound to which her natural children are so obedient. Being in the water, they seize insects of every kind, which they can only know from their instincts to be good for food. It is impossible, I think, to explain these facts, except by supposing that they depend upon feelings or desires in the animals developed with their organs, which are not acquired, and which are absolutely instinctive. I will mention another instance. A friend of mine was travelling in the interior of Ceylon; on the banks of a lake he saw some fragments of shells of the eggs of the alligator; his curiosity was excited, and he was induced to search beneath the surface of the sand; he found several eggs, which were still entire; he broke the shell of one of them, when instantly a young alligator came forth, perfect in all its functions and motions. It ran with great agility; and when my friend attempted to stop it with a stick, assumed a threatening attitude, and bit the stick with the greatest violence.

It made directly for the water, which (though born by the influence of the sunbeams on the burning sand) it seemed to know was its natural and hereditary domain. Here is an animal which, deserted by its parents, and entirely submitted to the mercy of nature and the elements, must die if it had to acquire its knowledge ; but all its powers are given, all its wants supplied, and even its means of offence and defence implanted by strong and perfect instincts. I will mention one fact more. Swallows, quails, and many other birds, migrate in large flocks when their usual food becomes scarce ; and in these cases it may be said (I anticipate a remark of Physicus) that the phenomenon depends upon imitation, and that the young birds follow the old ones, who have before made the same flight. But I will select the young cuckoo for an unexceptionable example of the instinctive nature of this quality. He is produced from an egg deposited by his mother in the nest of another bird, generally the hedge-sparrow. He destroys all the other young ones hatched in the same nest, and is supplied with food by his foster parent after he has deprived her of all her natural offspring. Quite solitary, he is no sooner able to fly than he quits the country of his birth, and finds his way, with no other guide than his instinct, to a land where his parents had gone many weeks before him ; and he is not pressed to make this migration by want of food, for the insects and grains on which he feeds are still abundant. The whole history of the origin, education, and migration of this singular animal, is a history of a succession of instincts, the more remarkable because in many respects contrary to the usual order of nature.

Phys.—I have been accustomed to refer many of the supposed instincts of animals, such as migrations, building nests, and selection of food, to imitation; but I confess I cannot explain the last fact you have brought forward on this principle. Pray, Ornither, let me state your view as I understand it, that we may not differ as to the meaning of language. I conclude you adopt Hartley's view of association, — that the motions of the muscles in man are first automatic, and become voluntary by association; and that reason is the application of voluntary motions for a particular end. For instance, a child is not afraid of fire; but bringing its hand near the fire it is burnt, and the convulsions of the muscles produced by the pain end in removing the hand from the source of pain. These motions by association are made voluntary; and after this experiment he avoids the fire by reason, and takes care always to perform those motions which remove his limbs from the destructive agent. But in contrasting instinct with this slow process, you would say most animals, without having felt the effects of fire, have an innate dread of it; and in the same way, without having been taught or experienced pleasure or pain from the object, young ducks seek the water, young chickens avoid it; their organs have a fitness, or unfitness, for certain functions without education. In short, the instinctive application of the organ is independent of experience, and forms part of a train of pure sensations.

Orn. — I have no objection to the statement you make of my view of the subject; but I certainly should give to it a little more refinement and generality. In all the results of reason ideas are con-

cerned, but never in those of instinct. Without memory there can be no reason; but in instinct, nothing can be traced but pure sensation.

“*Poiet.*—Though, in the animal world, no ideas seem connected with instincts, yet they are all intended for specific and intelligent ends. Thus the swallow travels to a country where flies are found; the salmon migrates from the sea to the sources of fresh rivers, where its eggs may receive a supply of aerated water, and without this migration the race would be extinct*; and in this way all the instincts of animals

* Dr. Knox, in his paper entitled “Observations on the Natural History of the Salmon,” &c., published in the twelfth volume of the Transactions of the Royal Society of Edinburgh, appears to call in question the accuracy of the above opinion of my brother, relative to the influence of aerated water on the ova of the salmon. The grounds of his objection, to me, appear exceedingly unsatisfactory. It would occupy too much space here to consider them in detail, or to review his criticisms on my brother, which from one man of science on another, and the latter no more, are less liberal and courteous than I could have expected, even were they just, which I cannot consider them. Dr. Knox says, that “Sir Humphry Davy had a theory that all the salmon kind feed on one kind of food.” This is a mistake, and I cannot comprehend how Dr. Knox fell into it. My brother, in many places in his *Salmonia*, notices the very different kinds of food of different species of salmo and varieties of the same species; as of the char and gillaroo trout feeding on hard shell-fish, the large lake trout feeding chiefly on small fish, and the small trout of mountain streams and torrents living poorly and precariously.

Dr. Knox says, that my brother, “unable to explain why the true salmon, when taken in rivers even newly run, have the stomach quite empty, imagined a silly notion that this abstemiousness of the salmon arose from an instinct instructing him not to load his stomach on the eve of a long journey.” This is not decorous criticism: the idea was founded on facts, which my brother relates. It may be that Dr. Knox’s explanation of the apparent empty state of the stomach of the fish when caught in rivers is correct, viz. that its proper food is only to be found in the sea, such as the minute ova of the echinodermata, and of some of the crustacea,—an opinion the correctness of which must be determined by further and more extended observations. The teeth of the salmon, judging from their form and size, are hardly in accordance with such being their sole food.

Dr. Knox states, “that Sir Humphry Davy, on the authority of a

may be referred to intelligence, which, though not belonging to the animal, must be attributed to the Divine Mind. Is it not then reasonable to refer instinct to the immediate impulse of the Author of Nature upon His creatures? His omnipresence and omnipotence cannot be doubted, and to the Infinite Mind the past, the present, and the future are alike; and creative and preservative power must equally belong to it.

“*Hal.*—That instincts depend upon impulses immediately derived from the Deity, is an opinion which, though it perhaps cannot be confuted, yet does not please me so much as to believe them dependent upon the formation of organs, and the result of the general laws which govern the system of the uni-

person of the name of Jacobi, says, ‘that the ova of salmon are deposited in the gravel of rivers under streams, that they may be perfectly aerated, or exposed to water which is so;’ adding, “this reason, which appears so plausible, is probably not the true one.” My brother gives the experience of Jacobi, not for the purpose Dr. Knox supposes, but relative to the means of breeding fish artificially (vide *Salmonia*, p. 80., where Mr. Jacobi’s method is described, taken from Block’s *Ichthyologie*, under the head of *Salmo Fario*). The statement of my brother, that the salmon seeks for its breeding place the situations specified, was founded on experience of his own, and I might almost say on universal experience, and confirmed by various analogies.

Dr. Knox, because my brother states that the whale has no swimming bladder, concludes that he is ignorant of physiology and of anatomy, and therefore incompetent to make observations on the generation of the salmon. Dr. Knox might as well maintain that the late Baron Cuvier was ignorant of these sciences because he erroneously states that the frog and toad and *Batraciens* generally have a single auricle. Surely it is not liberal nor just to draw such a sweeping conclusion from a circumstance so limited. If it be a fact that the whale has a swimming bladder, it is an extraordinary one, and contrary to analogy; nor am I aware it is noticed by our best authorities on natural history, at least I have not been able to find mention of it either in Cuvier’s *Regne Animal*, or in Hunter’s *Observations on the Structure and Economy of Whales*, or in any other work on natural history, which I have had an opportunity to consult, even including Dr. Knox’s own papers specially on these animals.

verse ; and it is in favour of this opinion that they are susceptible of modifications. Thus in domesticated animals, they are always changed ; the turkey and the duck lose their habits of constructing nests, and the goose does not migrate. In supposing them the result of organisation and hereditary, they might be expected to be changed by circumstances, as they are actually found to be. Without referring the instincts of animals to the immediate impulse of the Deity, they appear to me to offer the most irresistible and convincing argument that can be brought forward against Atheism. They demonstrate combinations, the result of the most refined intelligence, which can only be considered as infinite. Take any one of the lowest class of animals, insects, for instance ; not only is their organisation fitted to all their wants, but their association in society is provided for ; and the laws of a perfect social community, as it were, are adopted by creatures that we are sure cannot reason. In the hive-bee, for instance, the instinct of the workers leads them to adopt and obey a queen ; and if she is taken away from them, or dies, they have the power of raising another from offspring in the cells by an almost miraculous process ; they work under her government for a common object ; they allow males to exist only for a specific purpose and limited time, and under the government of females, who preserve the society ; they send forth swarms, which readily place themselves under the protection of man. In the geometrical construction of their cells, the secretion of wax from their bodies, the collecting their food, and the care of their brood, there is a series of results which it requires a strong reason to follow, and which are the consequences of invariable instincts.

Bees, since they have been noticed by naturalists, have the same habits; and as it is probable that there have been many thousands of generations since the creation, it is evident that the instincts of the first bees have been hereditary and invariable in their offspring; and it cannot be doubted that they do now, as they did four thousand years ago, make some cells in combs larger than others, for the purpose of containing the eggs and future grubs of drones that are to be produced by a grub which they are educating for a queen bee, and that these cells are connected with the common cells by a series, in which the most exact geometrical laws of transition are observed. An eminent philosopher has deduced an argument in favour of the existence of Deity from the analogy of the universe to a piece of mechanism which could only be the work of an intelligent mind: but there is this difference, — in all the productions of nature the principle not only of perfection, but likewise of conservation, is found; marking a species of intelligence and power which can be compared to nothing human. The first-created swarm of bees contained beings provided with all the instincts necessary for the perpetual continuance of the species, and some of these instincts can scarcely be understood by man, requiring the most profound geometrical knowledge even to calculate their results; and *other instincts* involve what in human society would be the most singular state of policy, combining contrasted moral causes and contradictory interests. It is impossible not to be lost in awe at the contemplation of this chain of facts; the human mind cannot fail to acknowledge in them the strongest proofs of their being produced by infinite wisdom and unbounded power; and the de-

vout philosopher can scarcely avoid considering with respect a little insect, endowed with faculties producing combinations which human reason vainly attempts to imitate, and can scarcely understand.

“*Phys.*—I agree with you that if instinct be supposed the result of organisation, and that the first animal types were so created as to transmit their instincts invariably, generation after generation, it does offer a most triumphant and incontrovertible argument for the existence of an All-powerful Intelligent Cause. Even in the instance which led to this conversation,—the instinct which carries salmon from the sea to the sources of rivers,—it is only lately philosophers have discovered that the eggs cannot produce young fishes independent of the influence of air; and thus an animal goes many hundred miles under the direction of an instinct, the use of which human reason has at length developed, and man is supplied with an abundant food by the result of a combination in consequence of which a species is preserved.

“*Poiet.*—I do not understand, Halieus, your objections to the view I have adopted, which is sanctioned by the authority of a good ethic philosopher, Addison. Allowing the omnipresence and constant power of Deity, I do not see how you can avoid admitting His actual interference in all the phenomena of living nature.

“*Hal.*—As I said before, I cannot confute your view; but upon this principle, gravitation and the motion of the planets round the sun, and all the other physical phenomena of the universe, would be owing to the immediate action of the Divinity. I prefer the view which refers them to motion and properties, the results of general laws impressed on matter by Omni-

potence. This view is, I think, simpler; but it is difficult to form any distinct opinion on so high and incomprehensible a subject, on which, perhaps, after all, it is wiser to confess our entire ignorance, and to bow down in humble adoration to the One Incomprehensible Cause of all Being.

“*Poiet.*—I agree with you in your last sentence; but I still adhere to my own view, and I hope you will not object to a favourite opinion of mine,—that instincts are to animals what revelation is to man, intended to supply wants in their physical constitution, which in man are provided by reason; and that revelation is to him an instinct, teaching him what reason cannot,—his religious duties, the undying nature of his intellectual part, and the relations of his conduct to eternal happiness and misery.

“*Hal.*—‘*Davus sum non Œdipus.*’ I will not attempt to discuss this view of yours, *Poietes*; but I think I may say that all the instincts of animals seem to be connected with pleasure or utility. Perhaps there is no more pleasurable state of the human mind than when with intense belief it looks forward to another world, and to a better state of existence, or is absorbed in the adoration of the Supreme and Eternal Intelligence.”

The concluding part of the work, in which, in the character of *Physicus*, he describes his state of mind and sentiment when he wrote, with the feelings of earlier and happier life, are too characteristic and impressive to be withheld; and I shall insert the paragraph or two which contain them, and are connected with them, though it was my intention to have introduced no more quotations.

The angling friends walk to the rock above the fall of the Traun, about to part in different directions : —

“ *Hal.*—But our horses are ready, and the time of separation arrives. I trust we shall all have a happy meeting in England in the winter. I have made you idlers at home and abroad, but I hope to some purpose ; and I trust you will confess the time bestowed on angling has not been thrown away. The most important principle, perhaps, in life, is to have a pursuit, —a useful one if possible, and at all events an innocent one ; and the scenes you have enjoyed, the contemplations to which they have led, and the exercise in which you indulged, have, I am sure, been very salutary to the body, and I hope to the mind. I have always found a peculiar effect from this kind of life ; it has appeared to bring me back to early times and feelings, and to create again the hopes and happiness of youthful days.

“ *Phys.*—I felt something like what you described ; and were I convinced that in the cultivation of the amusement these feelings would increase, I would devote myself to it with passion ; but I fear in my case this is impossible. Ah ! could I recover anything like that freshness of mind which I possessed at twenty-five, and which, like the dew of the dawning morning, covered all objects and nourished all things that grew, and in which they were more beautiful than in mid sunshine, what would I not give ? All that I have gained in an active and not unprofitable life. How well I remember that delightful season, when, full of power, I sought for power in others ; and power was sympathy, and sympathy power ; when the dead and the unknown, the great of other ages,

and of distant places, were made by the force of the imagination my companions and friends; when every voice seemed one of praise and love; when every flower had the bloom and odour of the rose; and every spray or plant seemed either the poet's laurel or the civic oak, which appeared to offer themselves as wreaths to adorn my throbbing brow. But, alas! this cannot be! and even you cannot have *two springs* in life; though I have no doubt you have fishing days in which the feelings of youth return, and that your autumn has a more *vernal* character than mine."

CHAPTER VII.

REVISITS THE CONTINENT.—EXTRACTS FROM HIS JOURNAL.—LETTERS TO HIS BROTHER FROM AUSSEE IN STYRIA, AND FROM ISCHL.—EXTRACTS FROM HIS JOURNAL IN CONTINUATION.—“THE LAST OF THE O'DONOGHUES,” AN IRISH STORY, WRITTEN AT WURZEN.—LETTER TO HIS BROTHER FROM LAYBACH.—EXPERIMENTS ON THE TORPEDO AT TRIESTE.—LETTERS FROM ROME.—OCCUPATIONS THERE.—NOTE ON THE BRITISH MUSEUM, WITH SUGGESTIONS FOR ITS IMPROVEMENT.—SUDDEN ATTACK OF DANGEROUS ILLNESS.—LETTERS WRITTEN FROM HIS DICTATION.—PARTICULARS OF HIM DURING HIS ILLNESS.—NOTICES OF LITTLE EXCURSIONS WITH HIM IN THE NEIGHBOURHOOD OF ROME.—JOURNEY FROM ROME TO GENEVA.—HIS NOTICE OF DR. THOMAS YOUNG.—THE CLOSE OF HIS LIFE.—PUBLIC FUNERAL.—CONJECTURES RESPECTING HIS MALADY.

I AM approaching the end of my task, and it is now a sad one; for I have to record my brother's last journey and the close of his life.

Not finding his health improve materially or permanently at home, he decided, with the consent of his physicians, on quitting England for his favourite Alpine regions in Southern Austria. There he proposed to spend the summer, and in winter to descend into Italy. “I was desirous,” he says, in his “Consolations in Travel,” “of again passing some time in these scenes, in the hope of re-establishing a broken constitution; and though this hope was a feeble one, yet at least I expected to spend a few of the last days of life more tranquilly and more agreeably than in the metropolis of my own country. Nature,” he adds, in a strain of melancholy sentiment and high admiration, “Nature never deceives us. The rocks,

the mountains, the streams, always speak the same language. 'A shower of snow may hide the verdant woods in spring; a thunder storm may render the blue limpid streams foul and turbulent: but these effects are rare and transient; in a few hours, or at least days, all the sources of beauty are renovated; and Nature affords no continued trains of misfortunes and miseries, such as depend upon the constitution of humanity,—no hopes for ever blighted in the bud,—no beings full of life, beauty, and promise, taken from us in the prime of youth. Her fruits are all balmy, bright, and sweet; she affords none of those blighted ones so common in the life of man, and so like the fabled apples of the Dead Sea, —fresh and beautiful to the sight, but, when tasted, full of bitterness and ashes.'

He set out from London on the 29th of March; accompanied by Mr. Tobin (now Dr. Tobin), the eldest son of his early friend, Mr. James Tobin, a young gentleman who had nearly completed his medical studies. Passing through Austrian Flanders, they crossed from the Rhine to the Danube; and from thence at Donanworth, proceeding southward, the season not being sufficiently advanced to enjoy the Alpine country, they travelled without much delay to Laybach, where they arrived on the 4th of May.

At Laybach, for a little while he amused himself with fishing and shooting, and extending his observations on natural history. The petzardone was then in the marshes, and the hucho in the rivers. In the stomach of the former, in many instances, he found a peculiar caterpillar, that of the *Eporris cincta* of Borelli, which he believed might be the proper

food of this bird, and partly the object of its migration; and about the gills of many of the huchos which he caught he observed many leeches. This he connected with a general remark, which is entered in his note book, that "almost all the salmones, before and at the time of their migrations, are troubled with parasitic animals." He continues — "Are not these the cause of their migration? Yet why? — Those gained in warm water are destroyed by cold water; those gained in the sea are destroyed by fresh water."

On the 18th of May he quitted Laybach, on his way back to his "old haunts," an expression of his own, which he uses in an entry in his journal of the 22d, prefixed to an animated though brief description of scenery. — "22d. To my old haunt, Wurzen, which is sublime in the majesty of Alpine grandeur; the snowy peaks of the Noric Alps rising above thunder clouds, whilst spring in all its bloom and beauty blooms below; its buds and blossoms adorning the face of nature under a frowning canopy of dark clouds, like some Judith beauty of Italy,—a Transteverene brow and eye, and a mouth of Venus and the *Graces*."

Here he spent a few days. On the 24th he went to Raibl and to the Fletzbach brooks, intending, as he says in his journal, "to have gone to the source of the Isonzo, but was shown by a misinformed person three or four torrents, feeders of this river, in a glen as wild as any thing I have ever seen." He adds, — "The lake of Raibl very fine; perhaps as sublime, amidst fine woods, and perpendicular rocks, and snowy mountains, as any scene in Switzerland."

Proceeding towards Ischl, he spent about a week

in the beginning of June at Aussee. From thence I had the satisfaction of receiving from him the following letter:—

“ Aussee in Styria, June 3. 1828.

“ MY DEAR JOHN,

“ I hoped to have found a letter from you at Ratisbon, but I was disappointed. Indeed, from the experience of last year, I almost despair of any regular correspondence between us, whilst we are both in foreign countries. Notwithstanding the long, severe, and depressing malady under which I still labour, I am not entirely without the hope of ultimate recovery, and the few pleasures that I retain in this my state of earthly purgatory have principally reference to the enjoyments and prospects of my friends; and I indulge in the idea that you are well and happy, and *enjoying* a life, which I can say I only *support*, supposing that it pleases Omniscience to preserve me for some ends which I cannot understand, but which I trust belong to the great plan of goodness and mercy belonging to the Divine Mind.

“ I have made another visit to Laybach, and have seen some new and beautiful scenes. The valley of the Save, with its cataracts and lakes, particularly struck me. I have seen nothing so beautiful in Europe. It suits me better to while away my days in this solitary state of existence, in the contemplation of Nature, than to attempt to enter into London society, where recollections call up the idea of what I was, and the want of bodily power teaches me what a shadow I am. I make notes in natural history, fish, and prepare for another edition of my *Salmonia*; ride amongst the lakes and mountains; and

attach the loose fringe of hope as much as possible to my tattered garments. I am now going to Ischl, where there are warm salt baths, to try if they will renovate the muscular power of my arm and leg. This is a new experiment. I am disposed to think, with Dr. Philip and Charles Bell, that the radical evil in my case is diseased sensibility in the nerves of the digestive organs, affecting by sympathy the whole sensorial system, and that the determination of blood to the head is only a secondary symptom.

“ I intend to be in Ischl till the end of July. You will know by the time when you receive this letter whether I have a chance of hearing from you. If not, you had better address me at Laybach, where I intend to be again some time in September. I wish to go to Trieste in October, to make the experiments I have long projected on the torpedo. God bless you, my dear John !

“ Your affectionate friend and Brother,
“ H. DAVY.”

From Ischl he thus wrote me :—

“ Ischl, June 24. 1828.

“ MY DEAR JOHN,

“ I received your letter addressed to me at Ratisbon here a few days ago ; it was dated Corfu ; but from the names of the friends you mention, I conclude it must have been transmitted from Malta. I am sorry that you feel indisposed ; but with your temperate habits, knowledge of your constitution, and medical skill, I doubt not that your indisposition will be transient. I have been here a fortnight ; the scenery is beautiful, the temperature agreeable, and the Traun contains trout and grayling. I have used the warm

saline baths with, I think, beneficial effects, and I shall continue to use them as long as they seem to do me any good. I have nearly recovered the flexibility of the affected limbs, but not their former strength; and this I can hardly hope to do as long as I am obliged to live so low, and use so much aloetic medicine, but I shall go on,—‘*speranza.*’”

“I am afraid you are in a bad situation for assisting me in my inquiries respecting natural history; but the governor*, who I know is an ardent and excellent sportsman, may aid you. The other day, at Laybach, I ascertained that the double snipe, which I shot as late as the 17th May, fed only on a particular white larva, which I believe is found in Europe only in the early spring and late autumn. I should like exceedingly to know if the stomachs of those which migrate through the islands in the Mediterranean contain the same kind of food. I strongly suspect that the peculiar habits of locomotion of these animals depend upon the places and times where this food is found: the common snipe seems equally fond of earthworms and every kind of larva; but in the stomachs of the double snipe I have never found any other except this peculiar worm.

“If you meet with any officers or intelligent travellers who have been on the Black Sea, pray inquire if the hucho and if the eel are found there. I should suppose that the eel is unknown both in the Black Sea and the Caspian. You may see some Russians in Sir Edward Codrington’s fleet who can give you information on this subject. I suppose the hucho

* The Hon. Sir Frederic Ponsonby.

will be found in the Don, Dniester, and Dnieper, which will be, if my conjecture is true, without eels.

“ I hardly know what place to fix upon for the purpose of a secure point of correspondence. You may as well address here, as the letters will be forwarded as long as I continue in Austria. Should I become convalescent, and go to Italy, I shall hope to see you there. Pray present my compliments to Sir Frederic Ponsonby, and remember me very kindly to Sir Edward and Lady Codrington, Mr. Frere, and Sir John Stoddart.

“ I am, my dear John,

“ Your most affectionate Brother and Friend,

“ H. DAVY.

“ Let me know, if you can, if any ‘ salmo ’ is found in the warm parts of the Mediterranean ; *i. e.* if there is any fish analogous to our sea trout.”

In his journal on the 23d of July, at the same place, he writes, — “ This day completes my bathing here. I have used forty-one douches and baths, — a fair experiment. I hardly know if I have gained from the use of the saline water. *Generally*, I have gained a little in the flexibility of the limbs : the fly-rod, I think, has been more useful than the element on which it is used.”

His mind at this time, as if refined and sharpened by the discipline to which the corporeal system was subjected, appeared to have been even more than usually active and contemplative. His note-books as well as letters indicate this. It was now that he wrote

a considerable part of the additions which he designed for a second edition of "Salmonia," in value exceeding and in bulk almost equalling the original text. It was here that he planned, in part, his last work, so appropriately named "Consolations in Travel," or, "The Last Days of a Philosopher," and composed the first portion of it, the opening dialogue, called "The Vision," the sketch of which he began on a cloudy day, when the water was still discoloured by late rains, and consequently unfavourable for fly-fishing. And he appears to have contemplated at the same time other works, of which merely hints remain, — works, like "Consolations in Travel," and "Salmonia," which would have amused him in writing, without requiring a greater degree of mental exertion than was compatible with the kind of repose which he had prescribed for himself.

From Ischl he renewed his wanderings on the 26th of July; and by slow journeys, fishing and shooting by the way, he arrived at Salzburg on the 10th of August. From thence he as slowly returned towards Laybach, lingering amidst the magnificent scenery of these romantic regions, unwilling, as it were, to leave them, and yet requiring change.

At Wurzen, where he stopped a few days, and where the rain confined him more than usual within doors, he amused himself with writing a little Romance, which, as it may amuse the reader, and may be considered as a literary curiosity, I do not hesitate in introducing in this place, satisfied as I am that his reputation cannot be injured by its publication.

" THE LAST OF THE O'DONOGHUES.

" AN IRISH STORY.

" WHEN the Roman Empire was falling under the attacks of the northern barbarians, and every province that had belonged to the Imperial people offered objects to tempt the cupidity and lust of plunder that animated those numerous hordes, which from the east of Scythia to the west of Scandinavia, poured down like hungry wolves to devastate and destroy, the only place of refuge for the unfortunate citizens who bore the Roman name was in those countries where the Roman eagle had never been planted. The extreme north of Scotland, the Western Islands, Ireland, and even Iceland, received refugees from the Roman provinces, and the early civilisation of these rude regions is connected with this cause. In Iona, or Ikomkill, a fraternity of Roman monks, flying from Gaul, founded those edifices which were long sacred, and which the early kings of Scotland, and Norway, and the Western Islands, chose as the depository of their ashes, and the ruins of which in so desolate a situation still astonish the traveller. In Ireland several bodies of emigrants, driven from their abodes by the Goths and Vandals, established themselves, and formed colonies: some came from the western coasts of Gaul and Britain; others from Spain: a considerable Spanish colony took possession of Kerry, the most beautiful province of Ireland. This colony, which has sometimes been called the Milesian, mixed with the native Celtic sept inhabiting this country, and became numerous and powerful. It founded towns on the sea coast; it traded with the

opposite shores of Cornwall, Brittany, and Spain ; and teaching the Roman arts to the natives, imparted a considerable degree of civilisation. The chief who embarked in this expedition from Cadiz was named Patricius Donaus ; and his descendants, for a succession of ages, governed the colony, and the native Irish united to them, as independent chiefs or sovereigns, under the name of the kings of Kerry. The Roman name was gradually corrupted to one more suited to the Celtic dialect, which had come into use ; and Donoghue, with the patronymic O, was the title by which these chieftains were distinguished in Ireland.

“ The last of this race, who is the object of the present narrative, possessed more power and more territory than any of his forefathers. They had been contented with a rude fortified mansion, close to the town of Kinsale, where they entertained their vassals in the coarse style of hospitality, in which Celtic plenty was more conspicuous than Roman refinement. O'Donoghue, the last of his race, being wealthier than any of his forefathers, and having obtained a large quantity of Italian furniture from a Norman pirate shipwrecked on the coast, changed his residence, and built what in those days was considered a magnificent palace on the banks of the Lake of Killarney. The ruins of this palace, now called Ross Castle, form a striking feature in the beautiful scenery of this the most picturesque lake of the British Islands. O'Donoghue was able to display great magnificence in the arrangements of the interior of his mansion ; he adopted a new manner of living, and no longer entertained his noble guests at the same table with his menials, but had two halls, in one of which

he himself presided, and to which the nobles were called by the rattling of a silver chain on a silver salver. He commanded the whole of Munster below the Barrow, and could call into the field an army of not less than 20,000 men, under his knights and immediate vassals. Above forming an alliance with any of the native princes of Ireland, even the most rich and powerful, he sailed with a considerable fleet to Norway, for the purpose of demanding in marriage the eldest daughter of the king of that country, by name Bertha, a lady remarkable for her charms. His proposals were accepted : he brought his bride to Kerry, accompanied by a numerous suite, and lived with regal magnificence in his palace at Ross. Bertha, from the charms of her person, and the graces of her manner, was highly pleasing to the native Irish, and for some time the king appeared exceedingly happy. He employed himself in a manner well becoming a good sovereign, in improving the condition of his subjects, and in administering justice ; and the queen was a model for the imitation of the wives of his higher vassals.

“ In the suite of Bertha there came from Norway a very remarkable person, who was considered the nephew of the king her father, and was one of her principal friends and confidants ; but the intimacy between them appeared no greater than might well exist between such near relations, and O'Donoghue had willingly invited him to become the guest of his cousin at Killarney. The name of the Norwegian was Sweno ; he was remarkable for the elegance of his person, for great strength and activity, and for the grace with which he performed all martial exercises. O'Donoghue had the dark locks, black eyes,

and swarthy complexion, which marked his descent from a southern race. His queen was fair, but had auburn hair and darker eyes than are common to the Scandinavian people. Sweno's complexion was still fairer than that of his cousin, and his eyes were bright blue, and his hair of so light a flaxen colour as to be almost silvery; so it was scarcely possible to see three persons, when they sat together at table, more strikingly contrasted.

“Sweno soon became as great a favourite with O'Donoghue as he was with Bertha. He was consulted by him in all affairs of state; employed by him to train and discipline his forces; and, at last, accepted a command under the king, as general of the army. His near relationship to the queen made this appointment less surprising; and by his conciliatory manners, great affability, and magnificence in giving entertainments and presents (for he seemed both rich and liberal), he gained the affections of most of Donoghue's dependants, and became the idol of the army. In his preceding life O'Donoghue had never appeared ambitious; but when he reviewed his well-disciplined forces, and saw how fitted they were for military enterprise, he began to conceive plans for increasing his territory, and yielded to the advice of Sweno, who proposed his attempting the conquest of the western part of Connaught, then under an independent chief. In these rude times a pretext for war was easily found in the quarrels of some dependants, and the king marched with his army into the heart of the country he was desirous of conquering, and made himself master of Limeric, and of the person of the chief whom he had attacked. After this it became easy to subjugate the undisciplined kerns, who still

offered resistance; and in a few months the conquest of the territory of O'Shaugnessy was completed. Sweno advised him to remain some time at Limeric for the purpose of conciliating the affections of his new subjects; and by his command returned to Killarney with a numerous suite, for the purpose of escorting Bertha in state to her husband. The danger of intrusting so much power over the army to a foreigner had not escaped the notice of some of O'Donoghue's oldest and wisest counsellors. One of them, who held the highest place in his esteem, named O'Brien, had remonstrated with his chief on the impolicy of his conduct, and had particularly pointed out the impropriety of trusting the young queen to the escort of so handsome, so agreeable, and so enterprising a relative; but O'Donoghue was deaf to these representations, placing unlimited confidence in Sweno.

“Sweno did not return with the queen as soon as was expected; but O'Donoghue received the most tender letters from her, pointing out a slight indisposition as one cause of the delay, and, as another, the necessity of appeasing by her presence some slight discontents which had arisen in the western part of Kerry. The king was satisfied with these excuses; and as the first offered hints that the queen was in a state likely to provide his kingdom with an heir, he was contented that she should remain some time longer at Killarney.

“Meanwhile the independent chieftains of Connaught and Ulster did not see with indifference O'Donoghue's extension of his territory; for they considered his first attempt as the commencement of a plan for the subjugation of the whole of Ireland.

They held councils, raised numerous levies, and appointed Connor, a brave warrior, the son of the king of Ulster, to the command of their united forces. And they sent heralds to O'Donoghue, announcing that unless he immediately set O'Shaughnessy at liberty, and put him again into possession of his territories, they would directly commence hostilities against him.

“O'Donoghue, confiding in the strength of his army and the courage and skill of Sweno, sent an angry reply to the assembled chieftains, and war was the immediate consequence. He at first gained some slight successes; but being opposed by almost the whole strength of Ireland, these were transient, and he was soon driven back from Connaught, and obliged to take refuge in the mountains of Kerry. He had sent messenger after messenger to Sweno, who remained with a part of his army at Killarney, and received always the same answer, that he was immediately about to join him, and that his delay arose only from his levying new forces to ensure his triumph. O'Donoghue was now in a miserable situation: hemmed in on all sides by his enemies, he was obliged to make his stand on the fortified mountain of Innesmoor; and there he was in danger of perishing for want of provisions, unless he indeed preferred the perilous alternative of fighting with his enemies under great disadvantages of situation and number. This, his last resource, he was at length compelled to adopt; and bringing all his martial Kerry-men to bear upon the weakest part of the enemy's line, he attempted to cut his way through it in the pass of Dunglo, which opens on Killarney. The contest was furious and bloody. O'Donoghue

fought with great bravery, killed numbers of the enemy with his own single hand, and had nearly made his way with a chosen band of followers through the line, when he was arrested by Connor, the hero of Ulster. A furious combat immediately commenced between these two champions; the king of Kerry was struck from his horse wounded, and was about to render himself prisoner when shouts in the distance were heard. The noise of trumpets and the neighing of horses announced the arrival of a large body of cavalry, and frustrated the triumph of the Ulster men. O'Donoghue recognised Sweno at the head of them; his long flaxen locks floating down his shoulders, and his animated presence and triumphant air giving him the character of the genius of victory. Nothing could withstand his attack: Connor fell in the field under his powerful arm; O'Donoghue's scattered bands rallied; the men of Kerry were every where successful; and in a few days Kerry was completely cleared of the Ulster and Connaught kerns, and O'Donoghue being reinstated in possession of the domains of O'Shaughnissy, proposals for peace were exchanged between the contending parties. O'Donoghue generously gave up the town of Limeric and a part of the surrounding country to O'Shaughnissy; and by the advice of Sweno entered into a solemn compact with the kings of Ulster and Connaught never to pass the Barrow with any forces, to limit the number of his army, and to attempt no new plans of conquest.

“Peace being restored, O'Donoghue, with Sweno, returned to the queen at Killarney; his confidence in Sweno re-established, and if possible increased, by the late events: the whole party appeared as happy as

success, love, and friendship could make them. But rumours had spread amongst the soldiers of O'Donoghue, that Sweno did not owe his peculiar power and success in combat to mere human means; it was believed that he was supernaturally gifted. Stories were current that his cream-coloured charger had been seen to emit flames of fire from his nostrils on the day of his triumph in the field; and the easy conquest which he made of the hero Connor, and of so large a body of veteran warriors, was attributed to magic. It was said, moreover, that there were peculiar Runic characters marked on his shield, and that he had been observed at midnight on the island of Mucrish Abbey sitting by a fire of his own kindling; and that on this occasion unearthly forms were seen flitting around him, and unearthly voices heard, and music which appeared to be of another world. These rumours reached the ear of O'Donoghue, who attended but little to them, and only mentioned them to the queen, who did not treat them so slightly as he had expected; but said 'My cousin certainly is a wonderful man, and even at the court of my father was always supposed to be under the influence of a good spirit or genius, who gave to him powers which he always used for the best and most benevolent purposes. Speak to him yourself on this subject.'

"O'Donoghue followed her advice, and took the first opportunity that occurred of mentioning what he had heard to Sweno. 'Common rumour,' said Sweno, smiling, 'is in this instance, a very rare one, correct. The elements are under the power of peculiar spiritual essences or beings, who are capable by particular rites and ceremonies of being influenced by, and made subservient to, the destinies of man.

In my early youth I was acquainted with a Lapland seer, in whose cell I passed many nights of severe and terrible discipline ; and with hard study and vigils, and severe penance, I obtained knowledge which renders me far superior to other men ; but this knowledge, which I so hardly gained, I can easily communicate. I can impart it only to one person ; and to him, if properly applied, it will be a source of blessing and of happiness. It makes its possessor invincible, and may consequently be used for unworthy purposes of conquest or ambition ; yet such is its nature that if once misapplied it is lost for ever. The genius of the elements, who serves me, will only be obedient to good.'

" O'Donoghue was very much astonished by this confession of Sweno ; and urged him by arguments derived from the friendship which he bore him, the confidence which he reposed in him, and their relationship by marriage, to make him the partaker of that knowledge which bestowed so much power.

" Sweno did not seem at first to favour O'Donoghue's wishes ; spoke of the greatness of the boon he demanded, which, when given, could not be taken away, and seemed to require some compensation for conferring so great a benefit.

" O'Donoghue was profuse in his offers of reward to Sweno, — proposed to divide his kingdom with him, or to establish Limeric in a separate principality for him ; in short, to do what he desired. Sweno's consent appeared won by his importunity ; and he said to O'Donoghue, ' I select you, because I love you, to be a partner in the power which I now possess alone, and to give you means of commanding for the rest of your life a prosperity and glory belonging to no other mortal. Meet me at midnight in the

island of Mucrish, but come unattended ; you will find me sitting on a rock, at the small lake surrounded by willows, which is exactly in the centre of the island.'

"O'Donoghue did not fail to keep this appointment. Taking one of the smallest boats used for his aquatic amusements, he quietly rowed to the island. It was a beautiful night, calm and serene ; but the only light was that of the stars. O'Donoghue, who had never visited this island at such a time, had some difficulty in finding the spot indicated by Sweno ; but as he approached the centre of the island, he saw in the distance a red and glimmering flame, which he made the guide of his way. When he came near it, he found it was a fire made with some dry wood, arranged in a circular order ; and he saw Sweno sitting on a rock in the centre of it, his fair countenance and bright hair lighted up by the reflection of the red light from the glowing embers. 'Come not near to me, O'Donoghue,' exclaimed Sweno ; 'the spirits of the elements command within this circle, and you would be torn to pieces if you attempted to pass the boundary of fire without possessing that mysterious power which it is my intention to bestow upon you, and the moment for doing this is not yet arrived ; it will be announced by a signal from heaven.'

"The appearance of Sweno was so strange and wild, and there was in his countenance so much of a supernatural character, that O'Donoghue could not behold him without experiencing a certain sensation of fear ; and he involuntarily turned his eyes from the circle of fire towards heaven, and fixed them upon Jupiter, the evening star, then shining with great brightness above his head.

“ After a few minutes, soft music was heard in the air above ; it was followed by a loud shout, like the sounds of exultation ; a light flashed from the centre of the sky, and fell upon the spot where Sweno sat, who appeared now to O'Donoghue, surrounded by a blaze of white light, and the fire was extinguished. ‘ I have received permission,’ Sweno said, ‘ from the spirits of the elements to share my power with you ; approach now, and give me your hand.’ O'Donoghue trembled as he approached the wonderful light with which Sweno was surrounded, yet he slowly advanced towards him ; and when he had entered the luminous atmosphere, he felt an agreeable glow, and found his spirits immediately restored. Sweno grasped him by the hand, and his touch was like that of burning metal. ‘ Follow me,’ said Sweno ; ‘ your initiation shall be completed.’ He walked a few steps to the brink of the small lake, carrying with him his atmosphere of light ; he walked round it, and its waters became luminous as he made his circuit ; he stopped, held up his hand, and in a powerful and awful voice exclaimed, ‘ Spirits of the Elements ! this man is desirous of knowing and sharing your power : I commit to you his destinies.’ To O'Donoghue he said, ‘ You have nothing now to do but to plunge into the lake, — you will come out as if a new being, filled with wisdom, and with that strength which will subdue all things to your purposes. Lose no time.’

“ O'Donoghue rushed forward, and precipitated himself headlong through the luminous atmosphere into the water. After this, he was wholly insensible for many hours ; and when he had recovered from the trance into which he had fallen, he found himself

cold, wet, and shivering, lying on the shore of the lake; and his limbs felt as ice, though the sun was risen, and shone upon him in all its brightness. Sweno had disappeared. He attempted to walk towards his boat, but his limbs failed him. He looked into the calm and clear water, and what was his astonishment and horror, when he beheld the reflection of his lineaments! they were entirely changed. But he had gained no supernatural strength, no wonderful power: his limbs were shrivelled, his black hair was become silvery grey, and his youthful face was changed to one of a decrepit and palsied old man. He with difficulty made his way to the boat, and with greater difficulty pushed from the island, and again crossed the lake. He was immediately accosted by the keeper of the barges, who was about to chastise him for his effrontery in making use of one of the royal boats. It was in vain that he declared he was the master of the boats, and the king himself. The keeper considered him as a madman; and he owed his safety to the superstition so common in a rude age, which considers madmen as sacred, and the favourites of Heaven. He made his way to Ross Castle, and asked to see the queen; but he was refused admittance, and driven from the door by the servants. The only being who seemed to acknowledge him, and on whom the enchantment appeared to have no power, was his old and faithful wolf-hound Bran; he fawned upon his master, licked his hands, appeared as if sensible of his condition, and followed him as he departed with a heavy heart from his own door.

“The half-civilised Irish were at this time in a very peculiar state as to religion. The opinions of the Druids, who had long been the national priests,

were mixed with superstitions derived from the Scandinavian people; and the ministers of Hesus (the chief god of the Druids), who usually performed the rites of religion, combining the triple character of priest, prophet, and enchanter, were generally considered as possessed of supernatural powers. St. Patrick had just landed in the north of Ireland; but Christianity had only been heard of in Kerry. O'Donoghue, in his early youth, had been accustomed to perform his devotions at one of the cromlechs or druidical high altars, which stood on the top of Morgarton; but since his Norwegian alliance and his acquaintance with Sweno, he had neglected his religious duties: now they recurred to his mind as a resource in his misery, and he hoped something from the power and counsels of the Druid whom he had so long neglected.

“ He made his way to the sacred wood, where he found the Arch Druid sitting beneath the sacred mistletoe. As O'Donoghue approached he rose, and said, ‘ King of Kerry, I know you; you have neglected the gods of your fathers and the friends of your youth, and have fallen into the power of Hela. Prostrate yourself before the altar: you may yet be preserved, and restored to your kingdom; but it can only be by following exactly my counsels.’ O'Donoghue offered up a most fervent prayer to the neglected divinity. The Arch Druid having sacrificed a lamb, and prayed for expiation of the king's offence, retired to the secret or oracular part of the cromlech, where he remained some time, as if in communion with an unknown power. He then came forward, and said to O'Donoghue, ‘ Sweno is powerful, Hela is powerful; but Hesus is omnipotent. The enchantment which

thou hast suffered can be destroyed only in one way. Attend carefully to my advice, and pursue it with the utmost caution. Sweno has long been in love with your wife ; hitherto she has resisted his addresses ; but now, believing that you are dead, she is disposed to yield to him her person and her heart. By his enchantments he has gained the affections of your nobles, and they are prepared to proclaim him king of Kerry. In a few days he is to be married to Bertha, and crowned in your vacant throne. You must go to Ross Castle ; you must seek him when asleep, and you will see in his bosom a dagger engraved with curious Runic characters ; you must take this dagger, leave him asleep, and repair immediately to the same lake in which you received your transformation. You must throw the dagger into the middle of the lake, saying, ‘ Powers of darkness, take your victim ! God of my Fathers, restore thy servant to his former state ! ’ The enchantment will then be over ; Sweno will disappear, crossing the lake on his fiery courser ; the hearts of your courtiers will be changed, the affections of the queen restored to you, and you will be again the powerful and happy O’Donoghue. But beware of offering any violence to the person of Sweno : should you do this, your enchantment will continue for ever. He will fly over the lake, but it will be only to return to Ross Castle, and your existence will be spent in the vain pursuit of the phantom knight.’ — ‘ I will follow,’ said O’Donoghue, ‘ strictly all your counsels ; but how is it possible for me, in my present miserable state, to gain admittance to the apartments of my palace ? ’ — ‘ I was prepared for this,’ said the Arch Druid ; ‘ I place on your brows this wreath of misletoe, cut with

a golden sickle from the sacred oak ; wearing it you will enter the palace, unmolested, at any time and hour you please ; and Bran, your faithful wolf-hound, will be your guide to the chamber where your bitterest enemy, the fell wolf of Norway, sleeps.'

"O'Donoghue, after thanking the Arch Druid, and again offering up his devotions, hastened by the nearest road across the mountains to Ross Castle. He entered the apartments crowded with servants, preparing for a grand festival, without exciting the least attention. He sat down in one of the halls, where they were decking a magnificent table for an entertainment which was to take place on the morrow, till the crowd began to diminish ; and he could not refrain from the most melancholy reflections when he saw so many persons, his dependants, and some of them his relations, who had been under great obligations to him, so soon forgetting their king and their master, and worshipping a new idol. He contrasted the gratitude and memory of mankind with the affectionate feeling of the dog that lay couched at his feet, attached to his fallen and almost helpless master. He heard with impatience the watchbell strike the hours, till midnight arrived, when Bran gave the signal for action by a low whine.

"The dog rose, and with slow and steady steps tracked his way through a suite of apartments, till they came to the bed-chamber where Sweno lay asleep. A lamp which was burning near the bed showed O'Donoghue the countenance of the knight, and it appeared ferocious and malignant, different from what it had ever seemed to him in his waking hours : so true is it that sleep develops the natural character of the countenance, and destroys the effects of art.

“ O'Donoghue tranquilly withdrew the vest from Sweno's bosom, — saw the dagger, which he grasped with the greatest ardour; but, in lifting it up, he perceived a small chain beneath, which arrested his curiosity. He saw that it was made of hair, and that something was suspended to it. He raised the hair link, and recognised, with the utmost anguish, the hair of Bertha, and that the jewel suspended to it was one she had always worn in her own bosom. He could not doubt but that this was a pledge of her love. Jealousy of a most furious kind instantly took possession of him; his passion was irresistible; he raised the dagger, and exclaiming ‘Die, traitor!’ plunged it into the bosom of the knight.

“ A clap of thunder instantly broke over the apartment; the room was filled with a blaze of light; the knight uttered loud shrieks, and fled through the open doors, and O'Donoghue followed him in pursuit, the dagger still in his hand. At the gate of the castle Sweno, bleeding and still shrieking, sprang upon his war-horse, which was standing to receive him, and fled across the lake, leaving marks of fire where his courser's feet struck the water. O'Donoghue continued in vain pursuit; the menials were roused by the uproar of the elements, and saw the phantoms by the lightning which incessantly flashed from the heavens. The howlings of the faithful Bran awakened the queen, but she was awakened only to misery; her lover had disappeared, but his couch was stained with his blood. O'Donoghue was heard of no more as a living man.

“ St. Patrick soon after made his appearance at Killarney, and converted Bertha to Christianity. She became the foundress of the first monastic establish-

ment for females in Ireland, and lived a life of great sanctity. Her shrine is still visited by pilgrims from all parts of Europe. The spectre king and the phantom knight are still believed to haunt Killarney; and there is scarcely a peasant who will not assure you that he has seen the king, armed with a dagger, pursuing the white knight on his fiery war-horse across that beautiful and romantic scene."

This story he finished, I believe, at Laybach, where he arrived on the 30th of August, and from whence I received from him the following letter :—

" Laybach, Sept. 25. 1828.

" MY DEAR JOHN,

" I have just received your letter of the 25th July, which I have read with much satisfaction; it has removed some anxiety which a former letter had given me respecting the state of your health. Your pursuits, I know, when you are well, will be both useful and interesting, and connected with the improvement of your profession and the advancement of general science.

" I am much obliged to you for the hints you give me respecting the causes of the migration of birds; and I think the principle will apply generally to that of animals. The instinct or strong feeling which leads to these migrations is, I believe, generally connected with want of food; but I have no doubt it may be excited by other causes, which are ultimately related to the same want. Thus, in this province, the quails have already disappeared, though the grain on which they feed still is abundant in the fields; and I believe they were driven away by a storm, which covered the

mountains with snow, and was to them the omen of the approach of the Alpine winter. I doubt if the same causes which influence the health of man have much effect upon that of animals, who live according to natural laws, and not arbitrary customs, and whose lives and conduct, when they have not been domesticated, are under the influence of strong and invariable instincts. The insect which you call a caterpillar, that you found in the stomach of the double snipe, I have no doubt was a hexapode larva of a tibula, which I have always found, both in the spring and autumn, in the stomachs of these birds, and which I have no doubt constitute their favourite, if not their only food. I am glad you have so agreeable a society at Malta, and that you have health to enjoy it. Pray remember me in a particular manner to your new admiral*, and put him in mind of some very pleasant days we passed together at the Duke of Athol's, where his pursuit was hart shooting, and mine grouse shooting.

“ I will not enter into a detail of my nervous infirmities. I endeavour, as much as I can, to forget them. It is now six weeks since I have closed my seton, and I think I am better for it. I have much the same hopes as I had when I was here before in May, 1827, and from the same causes. You will recollect the letter I wrote to you at that time. I hardly know what my future plans will be. They must depend a good deal on a letter which I am now expecting from Lady Davy. If you do not hear from me again within the next fortnight, write to me at Rome.

* Vice-Admiral Sir Pulteney Malcolm.

Whether I shall be there or no is very uncertain. At all events, I take the chance. God bless you, my dear John.

“ Your affectionate Friend and Brother.

“ You will have seen ‘ Salmonia ’ by this time. I have made the second edition twice as large, and I hope twice as amusing. It contains many of my philosophical views, and some new and I hope true opinions in natural history. I send the copy for the second edition to Murray by the next opportunity.”

From Laybach, on the 6th of October, he went to Trieste, expressly for the purpose of trying the experiments he had been long meditating on the electricity of the torpedo. The results of some former trials made in 1814 and 1815 had created doubts in his mind, that the power which this fish exercises in giving shocks is identical with any known form or variety of electricity. It occurred to him that it might be a new species of electricity, as different from common electricity as that is from voltaic, or as voltaic electricity is from magnetism. The results he had hitherto obtained were negative, and so far in favour of this idea. He now wished to subject it to a new test, the magnetic, which he conceived would be decisive.

On the evening of the 8th he arrived at Trieste ; and the following day, having through the kind assistance of our consul, George Daring, Esq., procured two lively and recently caught torpedos, he instituted his experiments, the results of which were still negative, the shock of the fish transmitted through a very de-

licate galvanometer not indicating the slightest magnetic effect.*

On his return to Laybach he communicated his views on the subject, and the results of his experiments, to the Royal Society, in a paper, which was his last contribution. I shall insert the remarks with which he concludes ; — the apprehension expressed in them respecting himself was but too true.

Having given his opinion that animal electricity will be found of a distinctive and peculiar kind, he continues : —

“ Common electricity is excited upon non-conductors, and is readily carried off by conductors and imperfect conductors.

“ Voltaic electricity is excited upon combinations of perfect and imperfect conductors, and is only transmitted by perfect conductors or imperfect conductors of the same kind.

“ Magnetism, if it be a form of electricity, belongs only to perfect conductors and in its modifications to a particular class of them.

“ The animal electricity resides only in the imperfect conductors forming the organs of living animals, and its object in the economy of nature is to act on living animals.

“ Distinctions might be established in pursuing the various modifications or properties of electricity, in these different forms ; but it is scarcely possible to avoid being struck by another relation of this subject. The torpedinal organ depends for its powers upon the will of the animal. John Hunter has shown how

* Owing, I believe, to the human body having been made part of the circle.—Vide Phil. Trans. 1834. Part 2d.

copiously it is furnished with nerves. I have never, in examining the columnar structure of the organ in the torpedo, been able to discover arrangements of different conductors similar to those in galvanic combinations; and it seems not improbable that the shock depends upon some property developed by the action of the nerves.

“To attempt to reason upon any phenomena of this kind, as depending upon a specific fluid, would be wholly vain. Little as we know of electrical action, we are still more ignorant of the nature of the functions of the nerves. There seems, however, a gleam of light worth pursuing in the peculiarities of animal electricity, — its connection with so large a nervous system, its dependence upon the will of the animal, and the instantaneous nature of its transfer, — which may lead, when pursued by adequate inquirers, to results important for physiology.

“The weak state of my health will, I fear, prevent me from following this subject with the attention it seems to deserve, and I communicate these imperfect trials to the Royal Society, in the hopes that they may lead to more extensive and profound researches.”*

On the 31st October he quitted Laybach to proceed to Rome, where he arrived on the 18th of November. During the next two months and a half I received from him the following letters: —

* The results of the experiments which I have made on the electricity of the torpedo are not, on the whole, favourable to the idea entertained by my brother; namely, that its electricity is peculiar, at least judging of it by its effects. How it is produced, however, is still a mystery, though not more so than the light of the glow-worm or fire-fly. — Vide my paper already referred to on the subject.

" Rome, Nov. 23. 1828.

" MY DEAR JOHN,

" I have been much disappointed in finding no letters from you on my arrival here. Yet I wrote two letters from Austria and Illyria through the same channel, Trieste, by which you had before received them. I expected letters both at Bologna and here. I shall expedite this letter by the mail which goes to Corfu, and I hope you will receive it in a shorter time than by Marseilles. I shall say little about myself, except that the greatest pleasure I could receive would be from seeing you. I think I am better, but I have been exceedingly annoyed by the conduct of a servant,

* * * *

and I fear I shall have the whole trouble of dismissing my establishment, and forming a new one, unless I can find some charitable persons here to assist me.

" Morichini is extremely kind to me, and thinks I shall get well. The weakness and numbness in my left leg and hand still continue, but I think are less. In short, with perfect quiet, which I came abroad to seek, I think I should be comfortable.

* * * *

" The weather is beautiful. Days of bright sunshine, but no cold nor heat. I take exercise, and shoot as much as I can; but there is little to shoot now. The Campagna is too dry for snipes, and I cannot beat the woods for cocks; so I content myself with a few quails.

" I got at Trieste a fine active torpedo, and satisfied myself that the shock did not affect the magnet. Is it a new kind of electricity, developed by the

nerves? I have sent a paper on the subject to the Royal Society.

* * * * *

“God bless you, my dear John!

“Your affectionate Friend and Brother,

“H. DAVY.”

“Rome, Dec. 21. 1828.

“MY DEAR JOHN,

“I have just received your letter, which has given me much pleasure. I continue much as when I wrote to you last. My limbs continue weak; my digestive functions I think improved, and my tongue has almost lost its fur. I had hoped you might have paid me a visit; I now despair of this here; yet, perhaps, in the spring you could come to me at Trieste, and see me in Illyria. I would then show you my kind little nurse, to whom I owe most of the little happiness I have enjoyed since my illness. I shoot here a little, mount my ponies, and employ myself a good deal in literary pursuit. I have finished the Dialogues, and with one of them I am exceedingly pleased. You will find the second edition of ‘Salmonia’ quite a new work, and I hope far better than the first. Walter Scott has written a review of the first edition, which I am told is exceedingly laudatory.*

“Poor Dr. Wollaston has an attack of paralysis, and I am sorry to hear is without hopes. His severe and ascetic life has not preserved him. This complaint is certainly becoming more common in Eng-

* Quarterly Review.

land. I have heard of two or three other friends who have likewise suffered, — spare, abstemious men; James Macdonald is one of them.

“ I believe I told you I had closed all my drains, setons, and blisters. It is now four months. I have certainly not been worse, and I have lived rather more freely; but in every respect I have continued extremely temperate.

“ I told you of my experiments on the torpedo. I am making some here, comparing the force with that of the common electricity. We have very fine weather, but bad shooting, from the want of water. Write to me as often as you can; and believe me to be,

“ My dear John,

“ Your most affectionate Friend and Brother,

“ H. DAVY.

“ Monsignor Spada is my chief companion here. That most amiable man desires to be kindly remembered to you. The Guiccioli is likewise here; but I have not seen her yet. Morichini and the professors of the Sapienza do all they can to assist me in my electrical experiments.”

“ Rome, Jan. 30. 1829.

“ MY DEAR JOHN,

“ I have been long hoping and expecting to hear from you in vain. I have received but one letter from you since I have been here. Since the last month the weather has been very bad,—rain, and si-rocco; and I have suffered more, both in my limbs and stomach, than at any time since my illness. The pain and palpitation in the region of the heart has increased almost alarmingly, and I do not think I

have gained any strength in the weak limbs. This is all notwithstanding diet and discipline, and I suspect mine is a desperate stomach case.

“ I have finished *four* dialogues. I question whether they are poetical or philosophical. The last* is, I think, a fair statement of the hopes which may be founded on metaphysical considerations of the indestructibility of the sentient principle; but, after all, we merely confess our ignorance. The second edition of ‘*Salmonia*,’ quite a new work, is sent to the press. I think it will amuse you. It has amused me much.

“ I have been making new researches on the torpedo.

* * * * *

“ I suspect the use of their electrical organs is not at all understood. I believe it is connected with their digestion. Pray write to me as soon as you receive this letter. I shall go north in the beginning of March. I hope I shall live to go back to Laybach.

* * * * *

“ Should I die before, you will, I think, find my Dialogues in a state for *publication*; if I live, I shall make them more perfect.

“ If you do not receive this letter till March, write to me at Laybach; but I hope I shall hear before that I have a chance of seeing you.

“ The Vice-Legate often comes to see me, and often asks for you.

“ God bless you, my dear John !

“ H. DAVY.

“ You will have heard of poor Wollaston’s death.

* “ The Proteus, or Immortality ;” the 4th dialogue in “ *Consolations in Travel*.”

He lived to communicate his process for platina to the Royal Society. This was his last work, which he considered a duty."

On the 1st of February, two days only after this letter was written, he writes in his journal, — "Finished the dialogues fifth and sixth," which were the whole number in the "Consolations in Travel." And immediately after he adds, in Italian, — "Si moro, spero che ho fatto il mio dovere, e che mia vita, non e stato vano ed inutile."

On the 6th of February he addressed the following letter to Mr. Poole; and it was his last to him: —

"MY DEAR POOLE,

"I have not written to you during my absence from England, because I had no satisfactory account of any marked progress towards health to give you, and the feelings of an invalid are painful enough for himself, and should, I think, never form a part of his correspondence; for they are not diminished by the conviction that they are felt by others. Would I were better! I would then write to you an agreeable letter from this glorious city; but I am here *wearing away* the winter,—a ruin amongst ruins! I am anxious to hear from you,—very anxious; so pray write to me with this address, 'Sir H. Davy, Inglese, posta restante Rovigo, Italia.' You know you must pay the postage to the frontier; otherwise the letters, like one a friend sent to me, will go back to you. Pray be so good as to be particular in the direction; the Inglese is necessary. I hope you got a copy of my little trifle, 'Salmonia.' I ordered copies to be sent to you, to Mr. W., and to Mr. Baker; but as the

course of letters in foreign countries is uncertain, I am not sure you received them ; if not, you will have lost little : a *second edition* will soon be out, which will be in every respect more worthy of your perusal, being, I think, twice (not saying much for it) as entertaining and philosophical. I will take care, by early orders, that you have this book. I write and philosophise a good deal, and have nearly finished a work with a higher aim than the little book I speak of above, which I shall dedicate to you. It contains the essence of my philosophical opinions, and some of my poetical reveries. It is like the ‘*Salmonia*,’ an amusement of my sickness ; but ‘*paulo majora canamus*.’ I sometimes think of the lines of Waller, and seem to feel their truth —

“ The soul’s dark cottage, batter’d and decay’d,
Lies in new lights through chinks that Time has made.”

“ I have, notwithstanding my infirmities, attended to scientific objects whenever it was in my power ; and I have sent the Royal Society a paper, which they will publish, on the peculiar electricity of the torpedo, which, I think, bears remotely upon the functions of life. I attend a good deal to natural history ; and I think I have recognised in the Mediterranean a *new species of eel*, a sort of link between the conger and the *murœna* of the ancients.* I have no doubt Mr.

* Relative to this supposed new species of eel, I have not been able to find any observations in his note-books. It was probably a brown *murœna*, which I believe to be the *myrus* of Aristotle, and which in Malta is considered, as of old by Aristotle, the male of the common *murœna* (the *murœna* of the ancients ; *M. helena*, Lin.) Whether this is a distinct species, or merely a variety of the *murœna helena*, I have not yet been able to satisfy myself, though I have ascertained beyond doubt that the Maltese notion of its sex is not correct, having found in one specimen well developed ova.

Baker is right about the distinction between the conger and the common eel. I am very anxious to hear what he thinks about *their generation*. Pray get from him a distinct opinion on this subject. I am at this moment getting the *eels in the market* here dissected, and have found *ova* in plenty. Pray tell me particularly what Mr. Baker has done; this is a favourite subject with me, and you can give me no news so interesting. My dear friend, I shall never forget your kindness to me. You, with one other person, have given me the little happiness I have enjoyed since my severe visitation.

“ I fight against sickness and fate, believing I have still duties to perform, and that even my illness is connected in some way with my being made useful to my fellow-creatures. I have this conviction full on my mind, that intellectual beings spring from the same breath of Infinite Intelligence, and return to it again, but by different courses. Like rivers born amidst the clouds of heaven, and lost in the deep and eternal ocean, — some in youth, rapid and short-lived torrents; some in manhood, powerful and copious rivers; and some in age, by a winding and slow course, half lost in their career, and making their exit by many sandy and shallow mouths. I hope to be at Rovigo about the first week in April. I travel slowly, and with my own horses. If you will come and join me there, I can give you a place in a comfortable carriage, and can show you the most glorious country in Europe, — Illyria and Styria; and take you to the French frontier before the beginning of autumn, — perhaps to England. If you can come, do so at once. I have two servants, and can accommodate you with every thing. I think of taking

some baths before I return into Upper Austria ; but I write as if I were a strong man, when I am like a pendulum, as it were, swinging between death and life.

“ God bless you, my dear Poole !

“ Your grateful and affectionate Friend,

“ H. DAVY.

“ Pray remember me to our friends at Stowey.”

From this time till the 20th his state of health continued variable ; and he continued (as appears from his journal) to have occupied himself variously, — in shooting, in examining the structure of the torpedo, in electrical experiments, in sketching the characters of distinguished men his contemporaries, and in making additions both to *Salmonia* and his new *Dialogues*.*

* About this time, or shortly after, during his illness, he expressed his views respecting the British Museum, pointing out some of its deficiencies, and suggesting a plan for its improvement. He had thought much on the subject, having been well acquainted with the establishment in his capacity of trustee, as President of the Royal Society ; on which account I think it right to give his sentiments, as they were written down from his dictation, with the hope that some of his hints may be followed, to the benefit of the museum.

The subject is introduced incidentally, in noticing the collections of the objects of natural history in America, in connection with science in America and her men of science, in digression from the character of the late Dr. Woodhouse, who brought a letter of introduction to my brother in 1804 from the venerable Priestley : —

“ I believe no country can be placed lower than our own in respect to collections in ancient art or modern science. A few liberal-minded patriotic men have done much by their private collections ; and some particular institutions or colleges, by their private means, have afforded resources to scientific men ; but our national establishment, the British Museum, is unworthy of a great people, and is even inferior to many of those belonging to second-rate states on the Continent : yet there have been considerable sums of money devoted to the objects of this collec-

On the 20th, most unexpectedly, for there had been no premonitory symptoms, and quite suddenly,

tion, and it contains some choice marbles, and some interesting specimens in natural history; and far more might have been done with the sums voted for the purpose by parliament, had they been judiciously applied.

“ When the British Museum was first established, in consequence of the bequest of Sir Hans Sloane, President of the Royal Society, of his splendid collections to the country, the trustees were either great officers of state, owing their situation to their office, or some persons of science, art, and letters associated with them, elected by the principal trustees. At first, the leading trustees of the elected class were either distinguished members of the Royal Society, or highly accomplished noblemen and gentlemen, possessed of refined knowledge in art or profound knowledge in science. The last scientific trustee elected was Mr. Henry Cavendish. Lately the elections have been almost entirely made from branches of the aristocracy, or gentlemen of some parliamentary influence. The Archbishop of Canterbury, the Lord Chancellor, and the Speaker of the House of Commons are considered as the really active members of the trust; and overpowered, as those great officers must be, with the religious, legal, and legislative affairs of the country, it cannot be supposed that they can have much leisure or much opportunity to attend to the government or arrangement of the national collections.

“ All the officers of the museum, who ought to be either efficient librarians or curators of the house, used to be elected in turns by the Archbishop of Canterbury and the Speaker of the House of Commons; for the late Chancellor, Lord Eldon, always refused to act as trustee, considering, probably, with great propriety, that he had other duties more essential to his office to perform. It is not, therefore, to be wondered at, that amongst the curators, assistant librarians, and sub-librarians, there should be found many persons taken from the inferior departments of the church and of the public offices; places abounding with respectable, well-educated men, but not the natural seminaries of either naturalists or of persons of profound and refined taste in antiquities, collections of the works of art, and monuments of the genius of the great people of antiquity.

“ If men of the highest distinction as to scientific character had always occupied the most exalted offices in the museum, either as curators of the collections, or as zoologists, ornithologists, entomologists, mineralogists, botanists, and superintendants of the ancient collections of sculpture and painting; and if the salaries of such officers had been made respectable, and their rank a gratifying or enviable one, — there would have been always a sufficient number of aspirants after such situations, and we should not have required the assistance of foreigners in that establishment which ought to be the natural school of our academies in science and art. But, unfortunately, in England science is not

he had that severe attack which ultimately proved fatal. That morning (as he told me afterwards) he felt better than usual, — his pulse about 68°; the tongue clean; the ordinary functions of the body

the taste either of the court or of the government; and what might be the most magnificent collection of the beauties and wonders of nature and art, formed from every quarter of the globe, and containing the most splendid monuments of the glory of the most powerful of the ancient nations of the earth, does, in fact, represent little more than a series of quaint collections in vertu, where illustrations of the history of medals and the most exquisite specimens of the bronzes of Magna Græcia are found in the same room with the sledges and dresses of the Esquimaux, the canoes, arms, and dresses of the people of Australasia, and the wildest ornaments invented either by the capricious or diseased fashions of folly in almost every climate and age. Even the first and most perfect part of the marbles brought from Athens to enrich the hotel of Montague House, are out of place.

“ There must be a general system of change in every thing belonging to this institution, before there can be any system of radical improvement. Each department must be preserved separate and distinct from the other. The sculpture must be judged by men who have shown their knowledge of taste with regard to this branch of the fine arts. The collection and arrangement of paintings must be trusted either to artists themselves, or to refined judges of the art. The geologist should have his department entirely to himself; and the mineralogist would not find even the present treasures of the British Museum too extensive for much active labour, philosophical research, and even useful discovery in the variety of their arrangements and bearings; and a good geologist, by connecting the history of the specimens of inorganic nature with those of living animals, might open to the world a number of curious and very extraordinary truths. Then the libraries should be kept perfectly distinct from the other parts of the museum; and there should be at least four enlightened and literary men of ability, to take charge of these treasures, now made so magnificent by the royal gift, and to lay them open to the public.

“ It appears to me that the present is the best moment for attempting a radical and fundamental change in every thing belonging to this ancient, misapplied, and, I may almost say, useless institution. In every part of the metropolis people are crying out for knowledge; they are searching for her even in corners and bye-ways; and such is their desire for her, that they are disposed to seize her by illegitimate means, if they cannot obtain her by fair and just ones. This, then, is the moment to give energy to their efforts, and for the legislature to sanction what reason has so long required.”

well performed. After breakfast he had sate some time, dictating an addition to the sixth Dialogue: when he had finished it he attempted to rise to go into his bed-room, which was adjoining; but found that he could not stand, and that he had lost all power over his limbs, without pain of head, or vertigo, or loss of power of intellect, accompanied merely by a feeling of sickness of stomach. Medical aid was immediately had; leeches were applied to the temples, as if the brain had been affected; and a lowering (or, as it is called, antiphlogistic) plan of treatment was pursued, but with no good effect. He spent the night very restlessly, and the following morning the right side was quite powerless, and the stomach much deranged. On the 23d he dictated the following letter to me; it is very descriptive of his state, and of the tone and powers of his mind: —

“ MY DEAR JOHN,

“ Notwithstanding all my care and discipline, and ascetic living, I am dying from a severe attack of palsy, which has seized the whole of the body, with the exception of the intellectual organ. I am under the usual severe discipline of bleeding and blistering; but the weakness increases, and a few hours or days will finish my mortal existence. I shall leave my bones in the Eternal City. I bless God that I have been able to finish all my philosophical labours. I have composed six dialogues, and yesterday finished the last of them. There is one copy in five small volumes complete; and Mr. Tobin is now making another copy, in case of accident to that. I hope

you will have the goodness to see these works published.

“ The second edition of ‘ Salmonia ’ by this time is, I believe, printed. I have given you, by a codicil to my will, the copyright of these books, and I shall enclose you an order on Murray for the profits of the first edition of ‘ Salmonia. ’ God bless you, my dear John ! May you be happy and prosperous !

“ Your affectionate Friend and Brother,

“ H. DAVY.”

It was signed by him ; and he added in his own handwriting, only just legible, “ Come as quickly as possible.”

On the 25th he dictated another letter, which I shall also give : for it is very characteristic of the zeal with which he pursued science, and his unextinguishable ardour in the pursuit : —

MY DEAR JOHN,

“ If I had not had this attack, it was my intention to have gone to Fumicina or Civita Vecchia to make some experiments on the torpedo. I hope you will take up this subject, which, both as a comparative anatomist and chemist, you are very capable to elucidate. You will see my paper on the torpedo in the manuscript book, which I have left in Mr. Tobin’s hands. It was my wish to have exposed an unmagnetised needle to the continued shocks of a torpedo in a metallic spiral, making the metallic communication perfect with both electrical organs. There is in my

little box an apparatus for this purpose, which I hope you will use. Large living torpedos may be procured at Fumicina or Civita Vecchia. The shock from a very small jar will make a needle magnetic, provided it is entirely passed through the metallic conductors; but I did not find this effect when there was any interruption by water. There are many things worth attending to in the two kinds of torpedinal fishes found here — the tremula and occhiatella. Pray do not neglect this subject, which I leave to you as another legacy. God bless you, my dear brother!

“ Your affectionate Friend,

H. DAVY.”

Beneath he made an attempt to write, and did write, “ My dear John,” but no more. His amanuensis wrote the following postscript, from his dictation : — “ I have written to you, but I fear you have not got the letter. I have this moment received your address. I am dying. Come as quickly as you can. You will not see me alive, I am afraid. God bless you !”

As he supposed, I did not get his first letter in time; indeed, it followed me to Geneva, where I found it on my arrival from Rome, and I read it only a few hours before he expired. His second letter I was so fortunate as to receive in a very short time, and I was able to leave Malta, where I was then stationed as Physician to the Forces, three or four days after, through the kindness of Vice-Admiral Sir Pulteney Malcolm, who allowed me a passage to Naples in his Tender. The voyage was a tedious one of six days.

I landed at Naples on the 14th of March ; at twelve o'clock at night I set out with the courier, and arrived at Rome early on the morning of the 16th.

I shall now, in continuance of my narration, give some account of the time I attended him at Rome, of our journey from Rome to Geneva, and of the termination of his earthly career in that city.

I shall not attempt to describe my feelings on receiving the last letter I have given, making known to me so suddenly and unexpectedly the dangerous illness of a brother who had acted the part of a father to me ; whom I regarded as a brother, a teacher, and most kind friend, and to whom I necessarily owed very much of what I most valued in life. My anxiety naturally increased the nearer I came to Rome. In vain I sought for fresh letters and additional information at Naples. When I entered Rome, I knew not where to find him ; for his address in that city was not sent. I in vain went from one hotel to another, making inquiries, without being able to hear any thing of him. I fortunately recollected that his friend Morichini was a physician, and a resident in Rome. He was easily found ; and presently I had a comfortable message from him, that my brother that morning was rather better, accompanied with a direction to his lodging ; and in a few minutes I was by his bedside. Never shall I forget the manner in which he received me ; the joy that lighted up his pale and emaciated countenance ; his cheerful words and extreme kindness, and his endeavours to soothe a grief which I had not the power of controlling, on finding him so ill, or rather at hearing him speak as if a dying man who had only a few hours to live, and who wished to use every moment of such precious time. With a

most cheerful voice, a smile on his countenance, and most warm pressure of the hand, he bade me not be grieved, but consider the event as a philosopher. He expressed his pleasure at seeing me so soon, and in having me with him in his last hours, and firmly rejected all expectation and hope of recovery. He said when he experienced the attack, just as he had concluded his Dialogues, he was sure his career was run; but, though persuaded of this, he had not rejected medical aid, and had followed the prescriptions of his physicians. Now I had arrived, he was contented; and he began immediately to speak of those things on which he wished to make me acquainted with his sentiments. A year and a half has now elapsed, and I write only from recollection. In the notices I shall give I shall endeavour to be as accurate as I can.

The subjects which now interested him most were, the peculiar electrical power and anatomical structure of the torpedo (the subject of his last letter to me, which I have given), and on which, just before his attack, he was making observations, and preparing to make fresh experiments; his last "Dialogues;" and the second edition of "Salmonia." On these subjects he spoke fully, especially on the first; and begged that I would immediately take up the inquiry, and go next morning to the fish market and procure some torpedos, that, with the fish before us, he might point out what he considered most deserving of notice. When my first agitation had subsided, and I had leisure to make inquiries into the exact state of his disease, I took hope; though when I expressed my hopes, he shook his head, and, with an incredulous smile, said it was useless, or something to that

effect. His symptoms at this moment were not at all alarming. The intellect was perfectly clear; the functions were tolerably well performed; the pulse not very rapid; and he had so far recovered the powers of the muscles of his limbs that, with some aid, he could rise, and go into the sitting-room; and that day he rose and dined in his room, and made a tolerable dinner on some roast chicken and spinach.

The greater part of the day I sat by his bedside, reading the "Dialogues," stopping occasionally to discuss particular parts. His mind was wonderfully cheerful, and tranquil, and clear, and in a very affectionate and most amiable disposition, and the expression of his countenance corresponded. He had lost all the irritable feeling which he was very liable to before, during his valetudinary state, and which was sometimes very distressing both to himself and those around him, and which generally accompanies paralytic complaints. His manner, his voice, and the expression of his countenance, the sentiments he expressed, his powers of argument, all gave the idea that the intellectual organ (to use his own words) in the attack had escaped unhurt. It was difficult to conceive such power of mind, when the body was near its dissolution; medically it seemed incompatible. At the same time, his own conviction that he was a dying man, connected with the many peculiarities of his complaint, and the tendency there sometimes is to believe easily what is dreaded as well as what is wished, almost persuaded me that his conviction of rapidly approaching death, founded on internal feeling, was true, and that the brilliancy of his mind was a "lightning before death."

On the following morning I procured some tor-

pedos from the fish market, and began an examination of this curious fish, which I dissected in an adjoining room, and I was employed alternately in reading to him the "Dialogues," or when not with him, as when he wished to repose a little, in carrying on my dissection, and occasionally showing him the results, and reading to him my notes of them, — all which not only amused, but interested him deeply. Thus several days passed, his mind continuing much the same ; he gradually became worse. He declined the attendance of his physicians, except that of Dr. Morichini, whom he saw as a friend ; he would take no medicine, except the acetate of morphia, which he used in large doses (and which had always the temporary effect of relieving uneasy sensations, and procuring sleep), and aperient medicine, with the intention of counteracting its constipating tendency. He gradually grew worse, and especially when I had finished the reading of the "Dialogues," and he had spoken to me concerning all the subjects on which he wished to express his sentiments ; he appeared now to be very much without motive for exertion, and considered this the exact and appropriate time for his death. His appetite failed him ; his bowels became very constipated ; there was a distressing dysuria, a very rapid pulse, profuse perspiration, a wandering of the mind on awaking from sleep ; and during sleep a very irregular respiration, very slow, and sometimes spasmodic. He was at the worst on the 31st March. On that day his pulse was amazingly rapid, more than 150 in frequency ; and his respirations, at one time, were only five in the minute. He would take no food, and he believed himself dying, as I did also, and often during the day expected that he would

breathe his last. Yet, even on that day, he now and then rallied his powers, and his mind recovered its distinctness and clearness, and required amusement. At his request, I read to him about the first half of Mr. Moore's "Epicurean." The sad colouring and melancholy sentiment which pervade that elegant little work, with the wildness of some parts of the fiction, and its marvellous subterranean scenery and incidents, pleased him much. At night he would not allow me to remain in his room, not even on a couch, as I had done before. He was sure he should die that night. He took leave of me most tenderly, kissed my cheek, and bade "God bless me!" His mind was perfectly tranquil, even as much so as on my arrival, but his symptoms were of a very different character; and witnessing the sudden changes which had taken place during the day, I believed that now indeed I was about to lose him, and that I should never again hear his voice of kindness. During the night, when I went into his room, I had the satisfaction to hear him breathing; and the reports of his servant, who had a bed in his room, when he came to me, were not unfavourable. The following morning, when I went to him and drew back his curtains, he expressed great astonishment at being alive. He said he had gone through the whole process of dying, and that when he awoke he had difficulty in convincing himself that he was in his earthly existence, and that he was under the necessity of making certain experiments to satisfy his mind that he was still in the body; as by raising the hand and intercepting the light, lifting the bedclothes, closing the eyelids, &c. He added, that his being alive was quite miraculous, and he now began to think his recovery not impossible,

and that it might be intended by Divine Providence that his life should be prolonged for purposes of usefulness. This change of opinion in regard to the possibility of his own recovery, gave me at the moment almost the delight that his recovery itself would have done, for I thought it promised it; and I enjoyed, I suppose, the pleasure in the anticipation, and at least in the revival of hope, at a time when all hope had ceased. The election, the same day, of a new pope, who took the name of Pius VIII., somehow, I think, aided in removing his former impressions of impending death. Now he was very willing to follow any course of medical treatment that I would recommend, and to be guided in all things by my advice as his physician, and to consider himself my patient. And without loss of time I proposed a plan of treatment, which was instantly entered upon; namely, the use of aperient medicine, combined with sulphate of quinine and acetate of morphine, and aided by a tolerably nourishing diet. From this day he pretty rapidly improved; all the distressing symptoms diminished, and in a few days they had entirely disappeared; and a change also had taken place in the state of his mind. Now that he was intent on recovery, he no longer took the same deep interest in *my* examination of the torpedo, as if he looked forward to the time when *he* should be able to enter into the investigation actively again; nor did the same kind of reading altogether interest him. I remember, on the day of his revival, proposing to resume the story of "The Epicurean." He objected to it, and said it was too melancholy. He preferred Shakspeare's plays; especially his comedies; and the "Arabian Nights," and "Humphrey Clinker." He delighted in hearing these

read ; and he was not comfortable unless some one was with him almost constantly during the day reading to him. When he had begun to mend a little, and my hopes were strengthened of his recovery, Lady Davy arrived from England, and brought him a copy of the second edition of "Salmonia," which gave him very great pleasure ; and, with his usual ardour, he began the reading of it immediately. In a few days, he expressed a desire to go out in the carriage. The weather was delicious during the whole of the month of April ; spring weather, I may say, really, according to the ideas of our poets ; the air balmy ; "warmth without heat, and coolness without cold ;" the thermometer seldom above 70°, and rarely below 60° ; the rains over ; the sky clear, of its mildest blue, and the Campagna green, of the freshest tint ; the gardens and groves bursting into foliage, and the distant mountains of that dark blue which is almost peculiar to Italy and Greece when the sky is clear and not parched. I look back to this time with a very great pleasure, and shall ever remember these drives in the neighbourhood of Rome with this feeling. To him they were particularly agreeable. The soft cool breeze refreshed him ; he liked to expose himself to it, especially his forehead. The delightful scenery, the cheerful appearance of the beautiful environs of Rome at this spring-time, the season of life and hope, seemed to exercise a restorative power over him,—to soothe, and please, and give hope. The second day that we went out he took me to the milky stream of the little Albula lake, which he has described in the third dialogue of the "Consolations in Travel," that I might have an opportunity of seeing its singular character ; and, whilst I left him for this purpose, he

got out of the carriage, and began to practise himself in walking, and on my return I found him sitting on a stone on the green flowery turf, and enjoying the Campagna, then most fresh and green, and beautifully contrasted with the adjoining wooded hills of Tivoli, and the few massive ruins of ancient buildings, appearing here and there above the vast expanse of verdure. Another day we drove into the Campagna, towards Albano, to visit the finest of all the approaches to Rome, where every object which meets the eye is impressive, and a relic of former times and the period of Rome's greatest grandeur,—the colossal tombs by the road side, and scattered over the plain ; the artificial inequalities of the surface, and tumuli ; and, most impressive of all, the vast aqueducts running parallel towards the city, their lines broken, and their lofty arches giving the idea of enormous temples. As was our custom, we got out at the end of our drive, and walked a little way on the Campagna for exercise ; and whilst we walked conversed on the subject of the extraordinary scenery around us,—so ancient, and yet the soil of volcanic sand, and still glittering with minute crystals of volcanic origin, mixed with fragments of red brick and pottery, and, owing to its arid and silicious nature, without calcareous or aluminous earth, giving to this part of the plain the character of sterility. But his favourite and our most frequent drive was on the way to Civita Vecchia, either close to the Tiber, or at a little distance from the course of the river, through the beautiful hilly region which stretches in that direction,—a succession of gardens, vineyards and orchards, villas and farm-houses, interspersed ; the road lined with trim hedge-rows, reminding one of England ; the orchards in full bloom, and

the vineyards rapidly sprouting and bursting into leaf, under the influence of the warm sun and air. This part of the environs used to be frequented by him, when able to amuse himself with his gun ; and we generally stopped at the distance of four or five miles, where, between the hills, there is a little open green plain in pasture, and where a sheltered hollow, rich in wild flowers of the spring, close to the road, was convenient for making his attempt at walking, and for sitting a little while in the open air, where the singing of the skylark and other birds made it very agreeable, and he had manifest pleasure in lingering. Were I to comply with my feelings, I should indulge myself in retracing, in memory, all our other drives in different directions round this wonderful city,—to the hilly road beyond St. Peter's, from whence the dome of that magnificent church, looking down upon it, is seen in minute detail in all its vastness ; to the different gardens, in that princely style of grandeur of art and rich luxuriancy of nature so happily blended at Rome, and no where else to be seen in such perfection ; and to the great ruins of antiquity, which from magnitude astonish and delight no less than by their picturesque beauty,—the rose, the vine, the cypress, and the olive luxuriating amidst their decay, especially on the Palatine, where the guides are gardeners, and the richest cultivation is mingled with and interrupted by ruined walls, and fallen masses and buildings in every stage of decay. After the confinement of a sick chamber,—after the abandonment of hope of recovery, to visit these scenes with my patient, daily, sensibly improving, was enjoyment indeed ; and the circumstances, and the occasion, I suppose, gave their tinge of feeling to every thing

around, and helped to make an impression on my mind, which will be durable always, of admiration of the scenery, and of its wonderful power of interesting beyond all other scenes I ever witnessed. I must not omit mentioning that, as he mended, the sentiment of gratitude to Divine Providence was overflowing, and he was most amiable and affectionate in manner. He often inculcated the propriety, in regard to happiness, of the subjugation of self, in all selfishness, as the very bane of comfort, and the most active cause of the dereliction of social duties, and the destruction of good and friendly feelings; and he expressed frequently the intention, if his life were spared, of devoting it to purposes of utility (seeming to think lightly of what he had already done), and to the service of his friends, rather than to the pursuits of ambition, pleasure, or happiness, with himself for their main object. So rapidly did he improve, that he was able to go in the carriage to witness the splendid illumination of St. Peter's, on the night of Easter Monday, and to quit Rome, on our way to Geneva, on the 30th of April; on due consideration, it appearing better to undertake the journey to a cooler climate, than to remain and encounter the heats of an Italian summer.

We travelled by easy journeys of from five and twenty to five and thirty miles a day, generally between breakfast and dinner, and stopped occasionally at the great towns, where the inns were comfortable, to rest for a few days. We took the road by Sienna to Florence, hoping that, though the inns are not so good on that as on the Perugino line of road, it would be less crowded by the English, then hurrying northwards from Rome; but our expectations were

not answered. On the 3d of May we arrived at Sienna. He bore travelling even better than I expected; and occasionally enjoyed the scenery, especially the beautiful wild mountain scenery, with its woods and lakes, between Ronfilione and St. Lorenzo, which the delicious weather we had, and the goodness of the road, and the rapidity and ease with which we travelled, made particularly agreeable; and hardly less so, in such delightful spring weather, was the ascent of the mountains to Radicofani, through the vine-clad glens and hills in the neighbourhood of Aquapendente, and the hilly pastoral region beyond it. At Sienna he rested a day. On the morning of the 5th of May we left it, and the same day arrived at Florence, where he recruited considerably, was in better spirits than usual, and stronger, and had a lively pleasure in an evening drive, once or twice in an open carriage, to the preserves of the Grand Duke, where there are so many circumstances combined to amuse and refresh an invalid, and especially a sportsman and lover of nature, — such as the luxuriant vegetation and foliage of meadows, shrubberies, and groves; the abundance of pheasants and other game; and the Arno, at this season a fine clear and rapid river. He remembered that when he had been at Florence before, he had eaten the ortolan in great perfection. He wished now to see it, and examine this bird as an object of natural history; but the season for it was hardly arrived. However, our intelligent courier procured one from a countryman, who was in the habit of catching these birds, and fattening them on bread and milk for the market, to which they are brought alive in cages. It was about the size and shape of a robin, but more delicate, with

plumage not unlike that of the robin, without its red-breast, — I believe it is the Provence wheat-ear of Latham (*Motacilla massiliensis*, Lin.)

From Florence we went by Lucca, Carrara, Massa, Sassana, Pescia, and the new mountain and maritime road to Genoa, where we arrived on the 12th of May. This part of our journey, almost without any exception, was agreeable. The mountain air, the mountain scenery, the delicious weather, with all the charms of May, were very enjoyable; the diversity of country, the triumph of art in the construction of this grand road, the magnificent views of the Mediterranean, its embayed and wooded shores, afforded ever-varying amusement, and the inns generally were comfortable and quiet.

We remained at Genoa from the 12th to the 18th of May. The first three or four days he was pretty well, and able to take an evening drive in an open carriage round the ramparts of the town, which command those delightful views of the extraordinary suburbs, where villas, gardens, groves, in rich profusion, mixed together on the most rugged ground, bounded by the white city and blue sea on one side, and the green precipitous naked mountain in the opposite directions, are singularly contrasted, and form a whole which is at once grand, beautiful, strange. During the last two days he was unwell, it was a time of much anxiety, and it was doubtful if he would be able to leave Genoa. We proceeded next by way of Novi and Alessandria to Turin, where we arrived on the 20th. The mountainous part of the journey was very agreeable to him; the air cool, the scenery amusing, and the road good. There was heavy rain during part of the day, but it

was followed in the afternoon by fine weather, accompanied by the delightful freshness of everything, and the increased beauty which, in the season of spring, and amongst mountains with abundant foliage and streams, the scenery always acquires. When we had passed the mountains, and entered upon the plain country, — when we had lost sight of the olive groves, and rarely saw the cypress, or the Mediterranean pine, and the vegetation indicated a cooler climate, the mulberry and poplar the prevailing trees, and the pasture of the brightest green, — the heat was greater, owing to the closeness of the air at the time, and travelling was tedious from the heavy roads. We stopped one day at Turin. At his desire, I visited the museum of the city, which is remarkably well kept, and rich in collections of natural history, especially of birds. I examined for him the water ousel, which has the singular and very curious habit of walking under water, and is alluded to in his “*Salmonia*.” He had inferred from analogy that it might be able to do this by means of air-pump feet, similar to those of the fly, and some other animals which walk against gravity; but I found its feet like those of the other birds of the great family *Passeres*, to which it belongs, merely fitted for grasping; and the intelligent naturalist, who very obligingly showed me the specimen, told me that it ran along the bottom of rivers only where there were stones for it to lay hold of.

On the 22d we went to Susa, and slept there. The drive from Turin to Susa he enjoyed much. The summits of the Alps were covered with snow, whilst advanced spring displayed all its charms in the deep narrow valley, through which the greater part of the

way winds ; and here it was truly “ *ver purpureum*,” for owing to the excess of flowers of this hue, especially a bright-red vetch, this colour was even predominant over green. On the following day we crossed Mont Cenis, and slept at Lanlesburg. He had rather an apprehension of this day’s journey, from the recollection of what we had experienced on a former occasion, already noticed, when we travelled together from London to Ravenna after his first attack ; but the apprehension, I am glad to say, was not confirmed. Indeed this was the most agreeable day’s journey of all, and the one which amused and pleased him most. The road was in excellent order ; the mules drew the carriage in the most easy manner. The sky was clear ; the temperature of the air most agreeable, warmed by currents of air ascending from the plain, as was indicated in a striking manner in one spot in sunshine, on the brink of a precipice, where a vast number of minute bodies were seen in agitation, moving in all directions, chiefly upwards, which we supposed at first were insects, their motion being apparently under the influence of volition, but which proved to be minute portions of the down of a small thistle. He felt refreshed by the light mountain air, aided by the influence of the Alpine scenery, which at the time was unusually attractive. The winter horrors of the mountains had disappeared ; spring had nearly reached their summit ; the snow remained only where it was most picturesque ; the torrents were in full force, and animated the scene with their noise and motion, as much as the bursting vegetation enlivened it in its young green on the chesnut in the lower region, and higher up in the larch and Alpine pine, almost to the top of the ascent, where even these hardy trees

showed the effects of winter,—the one without leaves, and the foliage of the other of a sallow and sickly green.

We reached the monastery of Mont Cenis about noon, but did not stop, excepting to get some trout from its tank, which he was very desirous of having; and he was much pleased when I returned to the carriage in a few minutes with two fine ones, which were taken out of the reservoir alive, especially as I had ascertained their temperature and the temperature of the water. The latter I found 40° , the former 42° . I may notice here, from the observations which I have made in crossing this mountain three different times, at different seasons of the year, that I believe 40° is the constant temperature of the water, which supplies the tank in a full stream, flowing from under snow; and that in consequence of this low temperature, which is probably the same as that of the bottom of the lake, from whence the fish are taken, the trout here is always in season. I am not aware that the trout has been observed before of so low a temperature; and I suspect that no where that the temperature of the water is not similar will the same peculiarity of constant good condition exist.* Besides temperature, it must, in part too, depend on having a never-failing supply of food; and that is here afforded in a small shrimp, which, it must be inferred, flourishes in cold water, and which I found in plenty in the stomach of one of the trouts.

The air and dreary aspect of winter still lingered in the mountain glen, in which the monastery is

* In accordance with this, I am informed that the char inhabiting the deep waters of the Coniston Lake, in Lancashire, are always in season.

situated ; in the shade the thermometer was 48° ; the surrounding peaks were still in their white winter clothing ; the grass of the plain surrounding the lake, only just exposed by the melting of the snow, was withered, as if it had felt the southern sun and drought ; and the lake itself exhibited a most singular appearance, from the shadows in it of the adjoining snowy heights, and from the mixture of snow, ice, and water on its surface, occasioning a confused, dazzling, glassy appearance, which was most disagreeable to the eye, as well as most perplexing to the understanding. Our horses, which had been sent up at an early hour in the morning, took our carriage rapidly down to Lanlesburg, where we arrived about two in the afternoon, — on his part almost without the feeling of fatigue.

We renewed our journey the following morning, and slept that night at La Chambre. At this season these Alpine valleys through which we descended were in great beauty, — I may say splendour ; such a profusion of wild flowers ; such rich pasture meadows ; such a variety of shrubs, and so many of our garden plants wild ; and then the singing of the birds, the sweetness and freshness of the air, and the gushing of the clear streams. When I recollect the circumstances of the season and scenery, not to mention its features of grandeur, — the snowy peaks, the forests of pine, larch, and birch ; when I recal my ideas of these scenes in Malta, and in September, the time and place in which I now write, — it is with a feeling of pleasure and regret, and it is difficult not to linger in memory amongst them.

The next day we went no further than Maltavern. It is a solitary inn, finely situated, and well kept.

We arrived early; and part of the afternoon my brother spent in the garden, sometimes walking, and when tired, sitting in an arbour covered with sweet-scented shrubs. The next day we passed through Chamberry to Aix, where I visited the baths, and made inquiries respecting their medicinal properties, with the idea that they might be fitted for him, and that it might be advisable to return to them from Geneva, if the physicians there should recommend trial of their waters. And by his particular desire I went to the adjoining lake of Burget, in which that rare and beautiful species of trout, the ombre chevalier, is found, in hopes of being able to get one, and collect particulars of its natural history, — a subject in which, even in his then state of health, he was so much interested, that he wished to visit the lake after his day's journey, merely to see the waters which fed a rare species of salmo, for there was no chance of procuring the fish itself, it being taken, as I was informed, in a distant and deep part of the lake.

The following day we went as far as the village of Frangi, through a beautiful country, in scenery, cultivation, and neatness reminding one of some of the finest parts of the midland counties of England.

On the 28th of May we arrived at an early hour at Geneva, and took up our abode at La Couronne, an excellent inn, the mistress of which is distinguished for civility; and I may add that I found it combined with very kind and good feeling, for the calling forth of which an occasion too soon occurred.

This short day's journey my brother bore well. During it we had a good deal of conversation; he reverted to past times, the early period of his life,

and to many of the more interesting parts of his life ; and spoke cheerfully, and not without hope, in regard to the future amendment of his health. On our arrival at the inn he merely reclined on a sofa, and occasionally walked to the window, and looked out upon the lake, and expressed a longing wish to throw a fly, as he had been before in the habit of doing, on its waters and on his favourite Rhone. Here he learnt the death of his old friend Dr. Thomas Young, as I have elsewhere observed.* I was not present when Lady Davy made the communication to him ; but when I returned I saw him affected, and he told me how deeply he had been affected by it, even to profusion of tears, and in a manner that was almost unaccountable. In a short time he recovered his composure and conversed on indifferent matters.

At five o'clock he dined at table, and made a tolerable dinner. After dinner he was read to, according to his custom. At nine o'clock he prepared to go to bed. In undressing, he struck his elbow against the projecting arm of the sofa on which he sat. The effect was very extraordinary : he was suddenly seized with a universal tremor ; he experienced an intense pain in the part struck, and a sensation, he said, as if he were dying. He was got into bed as soon as possible. The painful sensations quickly subsided, and in a few minutes were entirely gone. There was no

* My brother, in his sketches of the characters of his distinguished contemporaries, thus notices Dr. Young : —

“ I must not pass by Dr. Young, called Phenomenon Young at Cambridge ; a man of universal erudition, and almost universal accomplishments. Had he limited himself to any one department of knowledge, he must have been first in that department. But as a mathematician, a scholar, a hieroglyphist, he was eminent ; and he knew so much that it is difficult to say what he did not know. He was a most amiable and good-tempered man ; too fond, perhaps, of the society of persons of rank for a true philosopher.”

mark of hurt on the elbow, no pain or remaining tenderness ; and the effect of the blow perplexed him no less than it did me. A slight feverish feeling followed, which he thought little of ; he took an anodyne draught of the acetate of morphine, and then desired to be read to, that his mind might be composed to sleep by agreeable images.

About half-past nine he wished to be left alone, and I took my leave of him for the night, and for ever on earth. His servant, who always slept in his room, called me about half-past two, saying he was taken very ill. I went to him immediately. He was then in a state of insensibility, his respiration extremely slow and convulsive, and the pulse imperceptible. He was dying ; and in a few minutes he expired. I thank God, I was present to close his eyes ! In death his countenance was composed and of its mildest expression, indicative of no pain or suffering in the separation of the immortal from the mortal part. This fatal moment was about three A. M., on the 29th of May. It seemed as if it were destined that his ashes should not be deposited, according to his presentiment, in the " eternal city," but in a Protestant city ; the place for which we had expressly left Rome, and where death seemed to have awaited him, and where every mark of respect that could be paid to his memory was willingly shown by the government of this free and literary republic ; to the principal inhabitants of which he was personally known, and generally known by his reputation.

His funeral took place on the 1st of June, and was most respectfully attended.

The following was the arrangement of the procession, as given to me in writing : —

The Coffin, carried by Bearers.
The Servants.

John Davy, and the English Clergyman.
The Academy.
The Secretary of the Deceased.

The Council of State and the Clergy.
The English invited by the Committee
of the English Chapel.
The Society of Arts.
The Physical Society.
The Students of the Academy.
The Public.

His remains were deposited in the burying-ground of the city without the walls, and close to the grave of Professor Pictet. The spot is marked by a simple monument, in the form of an obelisk, erected by Lady Davy, on which is the following inscription:—

Hic jacet
HUMPHRY DAVY,
Eques Magnæ Britanniæ Baronetus,
Olim Regiæ Societ: Londin: Præses,
Summus Arcanorum Naturæ indigator.
Natus Penzantiæ, Cornubiensum, xvii Decemb: MDCCCLXXVIII.
Obiit Genève Helvetiorum xxix Mai, MDCCCXXIX.

I should notice that the students of the university were desirous of marking their respect by carrying the body, and made an application to this effect; which was not acceded to, from an apprehension that it might serve as a precedent, and lead to irregularities in a ceremony which in Geneva is performed in a very simple manner, and much restricted by the sumptuary laws of the state.

Respecting the nature of the complaint and the immediate cause of the death of my dear brother, I

have nothing to state that is at all satisfactory to myself. At its commencement, that is, after the first paralytic attack (it has been erroneously called apoplectic), in December, 1827, I was of opinion that there was some softening of the brain and some enlargement of the heart, without augmentation of its muscular substance. This opinion I expressed then to Drs. Babington and Holland, and I am now disposed to consider it as the most probable. It was my wish to have had the exact nature of his complaint and the cause of his death investigated by an anatomical examination. But this was contrary to his desire, and to a promise which I had made him at Rome. He had a dread of a *post mortem* examination, founded on an idea which occurred to his active mind, that it was possible for sensation to remain in the animal fibre after the loss of irritability and the power of giving proof to others of its existence. Consequently, such an investigation not having been made, his disease, as to its exact kind and the immediate cause of his death, must ever remain doubtful.

Before I quit this painful subject, I should remark that he had also a horror of being buried alive, before animation was completely extinct, and he desired that the interment should not be performed till after ten days. I was very anxious to have complied with this injunction, merely because it was his request; but at Geneva it was impossible, being contrary to law to keep a body so long unburied. The keeping it even three days was an indulgence; and as signs of putrefaction then began to appear, I made no opposition to the performance of the ceremony.

CHAPTER VIII.

HIS POSTHUMOUS WORK, "CONSOLATIONS IN TRAVEL, OR LAST DAYS OF A PHILOSOPHER." — NOTICES RESPECTING IT. — DESCRIPTION OF REMARKABLE DREAMS. — FRAGMENT OF A VISION. — PARTICULARS OF HIS PERSON, DISPOSITION, AND HABITS. — LETTERS OF HIS TO THE LATE MR. COLERIDGE. — PORTRAITS OF HIM. — LETTER FROM MR. POOLE REFERRING TO ONE. — LETTER FROM THE SAME GENTLEMAN ON HIS CHARACTER GENERALLY. — CONCLUDING REMARKS. — LINES ON HIM BY MR. SOTHEBY.

I HAVE now to speak of a work to which frequent allusions have been made in the preceding pages ; a posthumous work, and my brother's only one, "Consolations in Travel, or Last Days of a Philosopher," with which, probably, most of my readers are already acquainted, as it has passed through two ample editions.

It consists, as has been already mentioned, of six dialogues. The first dialogue, called the "Vision," is held between Onuphrio, Philaethes, and Ambrosio, and relates to the progress of society, the advance of science and art, and their influence on mankind ; with speculations on intellectual natures, and probable states of existence in other worlds. The scene is the Colosseum in Rome, by moonlight. The most important truth inculcated is, that in the progress of society, no useful discovery is lost ; all great and real improvements are perpetuated ; and that in consequence the welfare of mankind is in continued progression.

The scene of the second dialogue is the summit of Vesuvius, — the subject, discussions connected with the vision in the Colosseum, on religion generally, and on the Christian religion in particular ; in which Ambrosio, an enlightened and liberal Catholic, acts the part of the Christian advocate, 1st, defending the Mosaic account of the creation of man, as in strict harmony with reason, and accordant with all just metaphysical views of the human mind ; 2dly, maintaining that man was created with a religious feeling, or instinct, or knowledge, as represented by Moses, which declining with his fall, its place was supplied by Revelation, without which true religion must have become extinct on earth ; and 3dly, deriving Christianity from Judaism, — the same pure theism as that of the patriarchs, but spiritualised, and generalised, so as to be fit for all mankind ; founding his creed rather on the fitness of its doctrines than upon historical evidences, or the nature of its miracles, — and repelling objections, derived from any apparent want of conformity in the doctrines of Christianity to the usual order of events, on “ the principle that religion has nothing to do with the usual order of events.” — “ It is,” he eloquently says, “ a pure and Divine instinct, intended to give results to man which he cannot obtain by the common use of his reason, and which, at first view, often appear contradictory to it ; but which, when examined by the most refined tests, and considered in the most extensive and profound relations, are, in fact, in conformity with the most exalted intellectual knowledge ; so that, indeed, the results of pure reason ultimately become the same with those of faith. The tree of knowledge is grafted upon the tree of life ; and that

fruit which brought the fear of death into the world, budding on an immortal stock, becomes the fruit of the promise of immortality."

The third dialogue is held at Paestum. A character is introduced, called "The Unknown," who takes the lead in the conversation; and, from circumstances connected with the locality, proceeds to general views of the geological structure of the earth, and of the revolutions or changes which our planet has undergone, deduced from actual observations on existing strata. From geology the conversation turns to religion; and "The Unknown" continues the defence of Christianity on the same ground as Ambrosio; stating how, from a sceptic, which he was in his youth, he became a believer, from considering the intellectual faculties of brutes, compared with those of man, and by examining instinctive powers, which led him to the conclusion that revelation is to man in the place of instinct.

The same person appears in the fourth dialogue, which, as well as the two remaining, is held between him as the principal speaker and Philaethes and Eubathes. In the fourth, which is commenced at the falls of the Traun, in Styria, and concluded in the cavern of the Madelina, near Adelsburg, in Carniola, the conversation is partly relative to that singular animal the *Proteus anguinus*, partly on the subject of respiration and animal heat, and in part on the nature of the soul, and the destiny of man after death, in connection with belief in Christianity. In this last part, the main argument is upheld by "The Unknown," for the immateriality and consequent immortality of the soul, founded on the principle, or rather postulate, that sensibility and intelligence can-

not result from any possible combination of any insensate unintelligent atoms.

The person called "The Unknown" appears in the fifth dialogue, in the character of a chemical philosopher, gives some account of himself; points out the importance of chemical science to society; describes what a true chemical philosopher ought to be; the qualities of mind and the studies requisite to form him; the method of promoting chemical science, and the spirit of philosophy in which it ought to be pursued.

The scene of the last dialogue is at Pola, in Istria; and in it are discussed principally the effects of time, or the changes which take place on the surface of our globe from the action of the various causes to which material forms are exposed. Such is a very slight outline of the work.

To me these dialogues are particularly interesting, from the circumstances under which they were written, and the time and manner in which they were concluded; from the deep interest he expressed in them himself when I read them to him during the height of his illness, and when he supposed he had not many hours to live; from his having bequeathed them to me in his will, and entrusted me with the publishing of them; and I may add also, from their nature and tendency as to doctrine, and the manner in which they display his character, as a poet, as a metaphysician, as a geologist, as a chemist, and as a Christian, and in each the philosopher, in the original, modest, and humble meaning of the word. As such he began his career; as such he terminated it; and as such I trust his name will descend to posterity.

In the notice which I prefixed to the "Conso-

lations in Travel," I thought it right to state that "the characters of the dialogue were intended to be ideal, at least in great part; and that the incidents introduced, as well as the persons, were to be received only as subordinate, and subservient to the sentiments and doctrines." Notwithstanding this warning, even some of my brother's friends, who were well acquainted with the general occurrences of his life, have been inclined to receive as real, circumstances which were entirely imaginary. One gentleman, a very old friend, who is mentioned in his will, told Dr. Babington, after reading the "Consolations in Travel," that in a journey which he had made lately through Southern Austria, he had stopped, and fished at the falls of the Traun, and had heard of my brother's having been there; but was surprised that he heard nothing of the incident which in the fourth dialogue is described as having happened to Philalethes, or the author, viz. his being precipitated down the fall, and his being hooked up by an angler fishing below for hucho; and Dr. Babington asked me how that was, whether real or a fiction; and when I told him it was the latter, he further begged to be informed whether my brother had ever been in Palestine, its shore being introduced as the scene of a vision in the third dialogue. This was a very natural inquiry, as my brother had been so much abroad, and might have made (though he never did) a journey to Egypt and Syria, without its being generally known. As far as relates to scenery, I believe I may state that in the dialogues no other place is introduced excepting this, the site of the ancient Ptolemais, with which he was not personally and intimately acquainted.

On the persons of the dialogues a few remarks

may be required, on those features of them which may be considered as rather taken from life than ideal.

The resemblance between Ambrosio and Monsignor Spada has already been alluded to. I hope this gentleman will not be displeased with the reflected character, and sure I am he will not be with the warm zeal which animates Ambrosio's defence of the Christian religion. My brother, probably, made choice of a Roman Catholic for this duty, partly on account of the great political question then in agitation, and which at that time was so triumphantly carried, — I mean the Catholic question. In a letter to Lady Davy, written from his dictation, at Rome, just after his attack, and of which he gave me a copy, he expresses his delight on the occasion. He says, "I rejoice that the Catholic question is carried: without having a strong political bias, I have always considered this point as essential to the welfare of England as a great country, and connected with her glory as a liberal, philosophical, and Christian country." And partly from a friendly feeling, which he had, in some respects, to the discipline and doctrines of the Roman Catholics. The obedience which this church requires, the submission of reason, the unlimited faith, he considered favourable to religious feeling, and the securest harbour for the unfortunate and afflicted; the strongest hold against *popular* schism, scepticism, and fanaticism; and in accordance with the faculties and wants of the human mind, especially as regarding its affections. On the latter point he expresses himself strongly in his diary, on the 14th of June, 1827, at Aussee, on occasion of that beautiful ceremony, the Fête Dieu. His words

are, — “ Struck by the affecting nature and superiority of the Catholic religion, which gives joy and comfort to the heart, by making a festivity and not a hard duty of worship, — it is the *Fête Dieu*.” His views of the weakness and fallacy of reason on the subject of religion might have promoted a bias in his mind in favour of this church; and having travelled much in Roman Catholic countries, and witnessed the powerful influence which religion there has over the people, as regards habits of life and daily feelings, the bias might have been confirmed; and it must have been confirmed from seeing the positive civil and social advantages which it gives in comparison with the Protestant; its levelling, unaristocratic nature; its being no distinguisher of persons; its bringing all classes of people together, without distinction, in mixed worship, under the same roof; its throwing open the most splendid churches to the populace, and allowing them to be made an asylum to the pauper*; thus giving one kind of social liberty, that which is personal, in lieu of that which is legal, and which has generally been associated with Protestantism. But whilst he saw the advantages belonging to the Roman Catholic religion, he saw too the

* An Englishman returning from Italy, where he has been accustomed to see the most splendid churches open to the public for devotion, without distinction of rank or any exception, is necessarily pained, on visiting the great churches of our metropolis, to find their doors closed against him, and that he must pay to see them. In the former, the free access encourages devotion; probably, many who have entered from curiosity have had a better feeling excited, and have remained to pray. In the latter — our churches, — the angry feelings of the casual visitor, I apprehend, are oftener roused at the mercenary manner in which fees are exacted. Who can say that the shut-up state of Westminster Abbey is not disgraceful to England, both considered as a place of public worship and a receptacle of monuments erected by a grateful country to her distinguished men?

abuses to which it is liable, and which it had run into during its period of worldly prosperity. He himself, I believe, belonged to no church, excepting, in an enlarged sense, to the "Church of Christ," according to the declaration of "The Unknown" in the third dialogue, which there I consider his own.

In the description of the character of Eubathes in the fourth dialogue, there is a striking resemblance to his friend Dr. Wollaston, whose health had been declining before the dialogues were commenced, and who died, as we have seen, before they were finished. Secretaries of the Royal Society for many years together, a kind of generous rivalry had existed between them; and a volume of the Philosophical Transactions rarely appeared without contributions from both, conducive to the advancement of science. Dr. Thomas Young, during the same period, was Foreign Secretary. All three were Foreign Associates of the first class of the Institute of France.* Their deaths during the same year form a remarkable coincidence; and I am disposed to think that my brother had some mysterious feeling on the subject, that as there had been a kind of conjunction in life, so there was to be in death.

In Philalethes the author is supposed to speak in his own person, and may be considered as showing the progress of his own mind in relation to certain doctrines, metaphysical and religious, which are inculcated; but not even this in an absolute manner, and without exception. In giving an outline of the incidents of Philalethes' life, he must have had in view his own; their journeys were the same; the

* As the number is limited to eight, the honour is the greatest that can be conferred on a man of science.

valetudinary state the same; and his feelings were those so forcibly, and so mournfully and poetically given, in comparing the early career of Philaethes, and the enjoyments which London then afforded him, with his latter condition, when youth and health were gone, and when even ambition had lost its power over him, and in beautiful nature alone he found amusement from ennui, and unceasing charms. And the identity of Philaethes and the author is strengthened by the vision ascribed to the former in the first dialogue, and the dream in the second.

It may be supposed that the vision, as Ambrosio considered it, was a mere fiction — a poetical epitome of his philosophical opinions. But it was not exactly so. He says, — “The most important parts of it really occurred to me in sleep, particularly that in which I seemed to leave the earth, and launch into the infinity of space, under the guidance of a tutelary genius. And the origin and progress of civil society form likewise parts of another dream which I had many years ago; and it was in the reverie which happened when you quitted me in the Colosseum; that I wove all these thoughts together, and gave them the form in which I narrated them to you.” And in confirmation of this, in one of his note-books, there occurs a partial sketch of the two dreams, one of which he calls “a day dream.” As the foundation of this singular vision, I shall extract the notice verbatim: —

“*Rome, November 9. 1819.*—One moonlight night, when the summer seemed to pass into the autumn, and the zephyr blew as mildly as in June, I was walking in the Colosseum full of sublime thoughts, considering the loss of the Greek and Roman superstition,

and comparing it with the beadsman's worship in the midst of this sublime pile of ruins ; when of a sudden I saw a bright mist in one of the arcades, so luminous that I thought a person must be advancing with a light. I approached towards it, when suddenly it enveloped me ; an aromatic smell, like that of fresh orange flowers, seemed to penetrate not only into my nostrils, but even into my respiratory organs, accompanied with sweet sounds, so low that they seemed almost ideal ; and a sort of halo, of intense brilliancy, and of all the hues of the rainbow, above which appeared a female form of exquisite beauty. I was not alarmed, but rather delighted, at the new kind of ideal or sensual existence I experienced, when a voice, distinct, but like that of a flute, said, ' I am one of the Roman deities ! You disbelieve all the ancient opinions, as dreams and fables ; nevertheless they are founded in truth. Before the existence of man, and some time after, a race of beings who are independent of respiration and air occasionally dwelt on the globe, — the people of that assemblage of stars called the milky way ; but now your atmosphere is so gross we do not often visit you. We find the same difficulty in moving in your air that a bird experiences in attempting to use its wings in water. Our organized matter is infinitely more subtle than yours : when your planet was warmer, we occasionally dwelt with you. We have the power of arranging vapours and mists, and the matter that refracts light, so as to assume almost any form we like ; and we purify the common elements for our purposes. In the early stage of society we condescended to instruct man, a rude and gross race, and give them some of our know-

ledge. A day is sufficient for us to learn your language. I have acquired it in hearing three or four of your countrymen converse, and in reading one of your books. I am the most corporeal of all those beings; and an expenditure of common matter, in a flight which I made from Sirius to a star you call Alpha Lyra, induced me to pay a visit to the earth for the purpose of recruiting myself. The last time I was here——” Here the MS. terminates abruptly; and then immediately follows a notice of the other dream. He says, “I had on the 7th April, 1821, a very curious dream, which, because it has some analogy to the preceding *day dream*, I shall detail:—

“In the first part of the night my dreams were rather disagreeable, as well as I can recollect. It must have been considerably after midnight, when I imagined myself in a place partially illuminated with a reddish hazy light; within it was dark and obscure; but without, and opening upon the sky, very bright. I experienced a new kind of sensation, which it is impossible to describe. It seemed as if I became diffused in the atmosphere, and had a general sense of balmy warmth. Floating a little while in the atmosphere, I found that I had wings. Slowly, and with some difficulty, I rose in the air; and gradually ascending above the cave or recess in which was the red light, I found myself in the sky, amidst bright clouds and galaxies of light. It seemed as if I was altogether entering a new state of existence. I, for some time, reposed upon the highest of these galaxies, and saw as it were the immensity of space,—systems of suns and worlds, forming a sort of abyss of light, into which I seemed doubtful

whether I should plunge. At this moment I seemed in communication with some intelligent being, to whom I stated, that I had always been of opinion that the spirit is eternal, and in a state of progression from one existence to another more perfect; that I had just left a world where all was dark, cold, gross, and heavy; that I now knew what it was to have a purer and better existence, but that I hoped for something still more perfect; that I was now in natural warmth, light, and ether; and that I hoped to be, ultimately, in a world of intellectual light, where the causes of all things would be developed, and where the sources of pleasure would be unbounded knowledge. After this my dream became confused; my fields of light changed to a sort of luminous wood filled with paths, and the bright vision degenerated into a common dream."

The dream or vision of Philalethes I have alluded to in the second dialogue, may be dismissed with very brief notice. It occurred to my brother in the delirium of the feverish attack which he had, and which so nearly proved fatal to him, in the beginning of the winter of 1807; and, as he imagined, related to and was the image of the young person who twenty-one years after became his kind nurse in a remote part of Europe, and was of essential use to him in this capacity. Throughout life, I may observe, he was very subject in sleep to dream, and especially in early life, when his dreams were frequently of a very vivid and often terrific kind, and sometimes occasioned his walking in his sleep. Notice of dreams is not unfrequent amongst his memoranda; even as late as 1825 he gives an account of one, which I shall in-

troduce, as it is as remarkable for the reasoning power displayed in it as the others already given are for wildness of imagination. It is dated the 2nd of April, and is as follows : —

“ Last night, at Holme, slept in a bed full of fleas, yet my dreams were agreeable and full of intelligence. I thought I was arguing with a sceptic, who I believe was * * *. I said, ‘ Consider this world, all that we know of the universe ; everything is arranged in a manner which places chance at defiance. If all the planets and their satellites in their relation to the sun observe fixed laws, which, as far as we can conceive by analogy, are the same as those belonging to our earth, where everything is intended to produce perpetual life, it is a million to one that such combinations, which are, according to our analogies, intelligent, should be produced by accident.’ * * * ‘ Well, but how an intelligent cause ? what can you know of this ? It may be a spirit, a principle, an energy ; it is nothing we can grasp or understand.’ I replied ‘ No ; there is an intelligent cause, which is *God*. You cannot know or understand the Creator, the Infinite, the Divine Eternal Mind ; but you may wonder at its powers, adore its everlasting mercy, and be grateful for its unceasing goodness.’ ”

At no period of his life did he entirely disregard dreams ; he remembered more of them than is usual, but chiefly as phenomena of mind, though occasionally he may have indulged in the idea that their source was on high, according to the old Homeric notion, and given for forewarning.

“ *The Unknown*,” who stands so prominently out in the latter dialogues, by many readers may be received as a portrait of himself in a picturesque

disguise of dress and situation. If Philaethes may be considered as representing him in ordinary life, as what he was, it may be supposed that "*The Unknown*" was intended to represent what he wished to be, and that he was designed as the beau ideal of the chemical philosopher whose character he delineates. I remember, when reading to my brother during his illness the account which *The Unknown* gives of himself at the opening of the fifth dialogue, being struck with the resemblance and mentioning it to him; but he would not allow that the prototype of the character was himself. However, independent of his dress and some of the incidents of his life, he *was* essentially the prototype, in sentiments, feelings, opinions, doctrines, in brief, in mind; and their origin and their general course of life were very similar, and with some exceptions, too, their course of travel. The religious sentiments *The Unknown* expresses, and his metaphysical doctrines, were, I believe, entirely my brother's own—the last results of his mature studies. The reader will perceive that they are much the same as those which have been already given in the tenth chapter; proving how deliberately they had been formed, and how, for a number of years, the subjects had had his consideration. This resemblance I have already pointed out. It is most remarkable in the original argument, which he uses in favour of natural religion,—that *religion* is *instinct*, and that revelation is given to supply the place of this early intuitive knowledge or instinctive feeling; an argument which appears well adapted to such minds as those to whom *religion* is not *habit*, and to whom *analogy* is not *demonstration*, and whom reasoning has led to scepticism or infidelity.

Had he lived, I have no doubt he would have altered very considerably, and have added to these dialogues, agreeably to the intention which he expressed in one of his last letters already given. Though the subjects discussed had had his consideration for many years, and he brought to bear on them an accumulated stock of knowledge and poetical ideas,—with the exception of two of the dialogues, they were all rapidly written, and his plan for them was hardly matured. In a note in pencil, written in his journal just before his last attack, and when the sixth dialogue was not finished, he says, “I think I shall conclude with a vision of Eubathes, or with a meeting of the four friends, and a vision of Ambrosio. Whichever plan, I shall introduce the punishment of the bad, *retribution*; and the idea of the punishment of the wicked in the passions outliving the organs; the rewards of the good in pure intellectual enjoyments. How transient, even from their nature, are all sensual pleasures! Even the appetite, when satisfied, produces satiety.” And there occurs a fragment of a sketch of what was probably intended for such a vision, in illustration of the punishment of the wicked, a portion of which I shall introduce:—

* * * * *

“My time has been passed between long sleep without sense, sleep with terrible dreams, and more dreadful waking thoughts. This is the nature of my punishment,—the punishment of those souls who have avoided the sympathies of human nature, and sacrificed every thing to selfishness. They have all the desires of their mortal life, without any of the powers of gratifying them. They are everlastingly tormented by a vain and burning desire; they see objects which

they wish to grasp, but they have no hands ; objects of beauty floating before them in the air, but they have no wings to reach them ; they have ardent desire to converse, but they have no tongues ; they see lips moving, but they have no ears ; the volume of nature is open before them, but so distant that they are unable to read it ; they are burning, and the cool stream is beneath them, but they have no feet to reach it ; the eye, the most glorious of all senses, is their organ of punishment. It is revealed to me that moons, which roll round the planets, are the places of expiation for offending spirits ; and that the consummation of all things will be, when the moons rush to the planets, the planets to their suns, the suns to one great centre — when all will be light and joy, and all matter animated by one pure and undivided breath of Omnipotence.”

I have said that all the dialogues were rapidly written excepting two, and these were the fifth and sixth, the greater part of which had been composed previously some few years, and were intended to have formed a portion of a series of dialogues on chemical philosophy ; but which, though some other portions of them were composed, were never completed.

I have now given almost all the information I have been able to collect respecting the “ *Consolations in Travel*,” his “ *Legacy to the Philosophical World*.” In the letter to Lady Davy already referred to, written during his illness, in which he thus bequeaths these dialogues, after mentioning the precautions he had taken to preserve them, he adds, “ I should not take so much interest in these works, did I not believe that they contain certain truths which cannot be recovered if they are lost, and which I am convinced will be

extremely useful both to the moral and intellectual world. I may be mistaken in this point; yet it is the conviction of a man perfectly sane in all the intellectual faculties, and looking into futurity with the prophetic aspirations belonging to the last moments of existence." This was written from his dictation when he supposed himself dying. I trust he was not deceived in the estimate he made of the importance of this work; I trust it will be a beacon light to young and erring genius; that it will serve as a stimulus to good pursuits and to intellectual exertion; that it will tend to uphold the dignity of science, and protect the purity of scientific glory; and that in religion it will give encouragement to timid minds not to yield to the irony and scoffs of the gross materialist and atheist; that it will make scepticism less plausible, and that it will impart ardent hopes and the desire of a holy faith.

In regard to distinguished men, everything belonging to them acquires an interest; even trifling circumstances. We are desirous of knowing their form of body, expression of countenance, tone of voice, and manner of speaking; their mode of dress; and, in brief, all minute particulars, that we may form for ourselves as complete a picture as possible of them. Whilst the recollection of my brother as he was in his best days is still fresh in my mind, I shall record it, trusting that such a record will not be unacceptable, and believing that he belongs to that class of men of whom it is required, at least by posterity.

He was of middle stature, about five feet seven inches high; but appeared shorter, perhaps from the just proportions and symmetry of his make. His

hands and feet were small, and his bones in general small; but his muscles were comparatively large, especially of the lower extremities, in consequence of which he was well adapted for those exercises and sports of the field and river in which he delighted. He could walk well, and bear fatigue for a long time; his arms and shoulders were, he used to say, less able than his legs; yet their strength was perfectly adequate to the management of the salmon rod, and the laborious amusement of salmon fishing; and there were few anglers who could throw the fly further on the water, or with greater steadiness and delicate precision; and he was quick in the use of his gun, and amongst good shots a very tolerable one, especially in that kind of shooting which requires an active hand and eye, as snipe shooting. His chest was well formed and rather ample, and his breathing perfectly good, and he was a good swimmer; yet in early life, as noticed by himself in his "Researches," his respiration was unusually rapid, twenty-six in the minute, which is about six above the average; people in health generally making twenty respirations in the minute. As he grew older this quickness of breathing diminished; and latterly I believe it was rather slower than is usual.

His neck was rather long and slender: his head was rather small, its surface smooth and rounded, without any striking protuberances; the occipital part was small, the forehead ample and elevated, and very beautifully rising, wide and gently arched. His face was oval, and rather small; but, owing to the expansion of forehead, not apparently so. His features were not perfectly regular; the nose aquiline, and broad at its base; the mouth rather large, the under

lip prominent and full ; the teeth not large, but irregular ; his eyes were light hazle, and well formed ; his hair and eyebrows were also light brown ; the latter were scanty, the former abundant, and very fine and glossy, with a tendency to curl. I remember once a gentleman speaking to me about it, and expressing his admiration of its quality, very much in the manner he might use in speaking of a lady's hair. His skin was delicate, and his complexion fair, with a good deal of colour. His countenance was very expressive, and responsive to the feelings of his mind ; and when these were agreeable, it was eminently pleasing, I might say beautiful, for his smile was so ; and his eyes were wonderfully bright, and seemed almost to emit a soft light when animated. His voice was full-toned and melodious, with something in it which impressed his hearers, and made it remembered ; indeed, I have heard a lady, who resided in a distant part of the country, and who never saw him, remark, that she hardly ever remembered his name being mentioned without some notice of his voice being made. It was particularly well adapted to express feeling, that kind which was predominant in him,—the high and poetical,—and equally well adapted to convey tenderness and kindness. Without a musical ear, or a quick perception of the difference of sounds, he had studied its intonation carefully, and had so acquired a manner which a person with a fastidious taste for music might find fault with, and yet was very agreeable to a mixed audience. I recollect at the first anniversary dinner of the Royal Society, at which he appeared in his capacity of President, after the cloth was removed, and he had addressed the company in a speech which was extremely well re-

ceived, the gentleman who sat next me (and who was not aware that I was his brother), turned to me and said, he was sure the President was not musical; that his voice was very fine, but it was deficient in just musical modulation. The person who made this remark was, I believe, an amateur musician, and a distinguished critic in the science of sounds. His senses generally were acute, and well fitted for active life, and the successful pursuit of physical science, in which they are the messengers of information, and unless quick and accurate, may retard and lead astray even the most correct and penetrating minds.

His temperament was what is commonly called the sanguine, in which there is a tendency to excess of sensibility and irritability, and of vital action, combined with corresponding activity of mind, and a certain warmth and impetuosity of temper. A warmth of feeling and of action was essentially his, and marked almost all his doings and sayings. In his pursuits he was ardent and zealously persevering, stimulated by difficulties to exertion, and delighting to exercise the power he was conscious he possessed of overcoming difficulties, and as much in the ordinary affairs of life, and in shooting or fishing, as in matters of the greatest moment and of a scientific nature. The spring and elasticity of his mind were extraordinary. No misfortune could depress it long when he was in health, or, indeed, when suffering under disease. He considered yielding weakness, and always resisted it either by an effort of mind, or by change of pursuit or scene. This firmness of purpose and exertion were very remarkably shown during his long illness. He always strove and attempted to make head against it, trying various

remedies, consulting successively different physicians, using different kinds of diet, shifting his abode from the north to the south, according to the seasons and his sensations. Persons who did not comprehend his mind and temperament might misinterpret many of his actions, and especially while he was in a valetudinary state, and attribute almost to derangement of intellect what was the result of activity of mind and unyielding disposition; as his exercising himself not only in walking, but occasionally in running, when he was struggling with a paralytic affection of his right leg, on the idea that the muscles might probably recover their tone by exercise; and in his continuing to shoot and fish at a time when most men would have been confined to their rooms; and in prosecuting his scientific pursuits and literary labours even during dangerous illness, and when he supposed he had only a few hours to live. Many proofs of this have already been given, especially how he occupied and amused himself in illness. I may notice another instance of the same kind, which I have just turned to in looking over his note books, written from his dictation on the 28th of February, when he supposed his earthly career nearly run, a few days after his last paralytic attack; and I am the more tempted to give it, as it relates to the mind of an individual of whom he had a very high opinion, the late Dr. Jenner, and to a topic, humble indeed in itself, yet aptly showing, perhaps, the most remarkable features of his mind, great power of observation, and quickness of analogical application. My brother's words are:—

“ I remember, in 1809, having had a long conversation with the late Dr. Jenner, on the habits of

animals. He was always original and ingenious, but I think was sometimes carried too far by the remoteness of his analogies. We were discussing the possibility of the uses of earthworms to man. I was more disposed to consider the dunghill and putrefaction as useful to the worm, rather than the worm as an agent important to man in the economy of nature; but Dr. Jenner would not allow my reason. He said the earthworms, particularly about the time of the vernal equinox, move much under and along the surface of our moist meadow lands, and wherever they move they leave a train of mucus behind them, which becomes a manure to the plant. In this respect they act as the slug does in furnishing materials for food to the vegetable kingdom; and under the surface, they break stiff clods in pieces, and finely divide the soil. They feed likewise entirely on inorganic matter, and are rather the scavengers than the tyrants of the vegetable system."

He was warm and disinterested in his friendships, and delighted in cultivating them. Fashion did not attract him, nor rank, nor even genius and knowledge, so much as goodness of heart, and simplicity of mind, and steady worth of character. His oldest and dearest friends were thus distinguished. His sentiments on this subject, in relation to the marriage state, from which they are applicable to friendship generally, are forcibly expressed in the following extract from a letter which he wrote to a friend: —

"Upon points of affection it is only for the parties themselves to form just opinions of what is really necessary, to ensure the felicity of the marriage state. Riches appear to me not at all necessary, but competence, I think, is; and after this more depends upon the *temper* of the individual than upon personal,

or even intellectual circumstances. The finest spirits, the most exquisite wines, the nectars and ambrosias of modern tables, will be all spoilt by a few drops of bitter extract; and a bad temper has the same effect in life, which is made up, not of great sacrifices or duties, but of little things, in which smiles and kindness, and small obligations given habitually, are what win and preserve the heart, and secure comfort."

I shall introduce here a copy of a letter from him to the late Mr. Coleridge, without date, but supposed to have been written in 1802 or 1803, for which I am indebted to their common friend, Mr. Wordsworth. It will be acceptable, I trust, to the reader, in relation equally to the character of my brother and his distinguished friend, and as an example of the lofty and enthusiastic feelings of friendship of one man of genius towards another, as well as of that kind of exhortation which a man of genius alone could offer and receive: —

" Twelve o'clock, Monday.

" MY DEAR COLERIDGE,

" My mind is disturbed and my body harassed by many labours; yet I cannot suffer you to depart, without endeavouring to express to you some of the unbroken and higher feelings of my spirit, which have you at once for their cause and object.

" Years have passed away since we first met; and your presence, and recollections with regard to you, have afforded me continued sources of enjoyment. Some of the better feelings of my nature have been elevated by your converse; and thoughts which you have nursed have been to me an eternal source of consolation.

“ In whatever part of the world you are, you will often live with me, not as a fleeting idea, but as a recollection possessed of creative energy,— as an imagination winged with fire, inspiring and rejoicing.

“ You must not live much longer without giving to all men the proof of power, which those who know you feel in admiration. Perhaps, at a distance from the applauding and censuring murmurs of the world, you will be best able to execute those great works which are justly expected from you : you are to be the historian of the philosophy of feeling. Do not in any way dissipate your noble nature ! Do not give up your birthright !

“ May you soon recover perfect health, — the health of strength and happiness ! May you soon return to us, confirmed in all the powers essential to the exertion of genius ! You were born for your country, and your native land must be the scene of your activity. I shall expect the time when your spirit, bursting through the clouds of ill health, will appear to all men, not as an uncertain and brilliant flame, but as a fair and permanent light, fixed, though constantly in motion,— as a sun which gives its fire, not only to its attendant planets, but which sends beams from all its parts into all worlds.

“ May blessings attend you, my dear friend ! Do not forget me : we live for different ends, and with different habits and pursuits ; but our feelings with regard to each other have, I believe, never altered. They must continue ; they can have no natural death ; and, I trust, they can never be destroyed by fortune, chance, or accident.

“ H. DAVY.”

This letter had written on its back, by Mr. Coleridge, "This from Davy, the great chemist. It is an affectionate letter."

I am tempted to give another letter to Mr. Coleridge, for which I am also indebted to Mr. Wordsworth. It relates to the death of Dr. Beddoes, and is strongly descriptive of deep friendly interest. Had I received it earlier, I should have thought it right to have inserted it in that part in which I have been under the necessity of vindicating him from the extraordinary aspersion of neglect of friends, and especially of his early friendships. Well do I remember the time when he received the letter communicating the death of Dr. Beddoes, referred to in his letter to Coleridge. He was occupied at the instant in a very interesting chemical inquiry; he stopped,— read the letter, — exclaimed, with a burst of grief, "Poor Beddoes is no more!" And then resumed the experiment, — by an effort suppressing his emotion, strongly indicated by tears: —

"December 27. 1808.

"Alas! poor Beddoes is dead! He died on Christmas eve. He wrote to me two letters on two successive days, 22d and 23d. From the first, which was full of affection and new feeling, I anticipated his state. He is gone at the moment when his mind was purified and exalted for noble affections and great works.

"My heart is heavy. I would talk to you of your own plans, which I shall endeavour in every way to promote; I would talk to you of my own labours, which have been incessant since I saw you, and not without result; but I am interrupted by very melan-

choly feelings, which, when you see this, I know you will partake of.

“ Ever, my dear Coleridge,

“ Very affectionately yours,

“ H. DAVY.”

I have heard it said that rank had an undue influence over his mind, and that he courted too much the great; I believe in this there was a mistake. In fact, the great courted him, and paid him latterly more attention than many of his earlier acquaintances, on whose friendship he had more claims. His independence, and little attention to the great in the way of courting their favour, are strongly marked in the dedications of his works. His earliest production, his “*Essays on Heat and Light*,” were dedicated to Dr. Beddoes, and to the subscribers to the Pneumatic Institution, of which he was superintendant; his next work, his “*Researches*,” was sent into the world without a dedication; his next, “*A Syllabus of a Course of Lectures delivered at the Royal Institution*,” was dedicated to the managers of that establishment; his next, “*Elements of Agricultural Chemistry*,” to his friend Mr. Knight; the next, “*Elements of Chemical Philosophy*,” to Lady Davy, immediately on his marriage. His “*Discourses to the Royal Society*,” which were published at the request of the Council and many of the Fellows, were dedicated to them; his two last works, his “*Days of Fly Fishing*,” and “*Consolations in Travel*,” to two private friends, and on the score solely of friendship and kind feeling, “*Salmonia*” to Dr. Babington, “in remembrance of some delightful

days passed in his society, and in gratitude for an uninterrupted friendship of a quarter of a century," and the "Consolations in Travel" to Mr. Poole, "in remembrance of thirty years of continued and faithful friendship."

That he was much amongst persons of high rank is not surprising, considering how his society was sought; the attractions which belong to their best circles; the graces, and courtesies, and refinements which distinguish them, as well as the superiority of mind and of information which is usually to be met with in them; and what to him latterly must have been particularly agreeable, the freedom from all envy, and mean and paltry feeling, which he had sometimes to encounter amongst his fellow men of science, and the pretenders to scientific distinction.

Throughout life he carefully maintained his independence, and preferred rather conferring than receiving obligations: he certainly conferred greatly more than he received. This he knew, and he felt accordingly. He was delicately averse from, and fastidious about, asking favours, even for his friends, and of government, for which he frequently worked without emolument, and too often almost without thanks, public bodies being proverbially ungrateful. Nor was he at all of a mercenary disposition, of which he gave many proofs, combined with disinterested attachment and devotion to science.

I have mentioned already how he declined certain invitations to enter the church, with the assurance of the strongest support. I have mentioned also, that though he had every reason to expect eminent success in practice as a physician in London, yet considering the sacrifice of his tastes which he should be obliged

to make, this plan, too, of a golden fortune he soon relinquished. I have mentioned further, that though often urged to take out patents for discoveries which he had made, and especially for the safety lamp, he never yielded for a moment to these solicitations, considering such practices unworthy of a man of science. Nor was he prodigal of expense, or parsimonious ; but lived very much according to his means, using a just economy.

In disposition he was eminently social and cheerful, when in health delighting in society, and always well received, from his powers of pleasing, and amusing, and instructing, under the guise of agreeable conversation. In relation to company, he was not fastidious in taste : when he had choice, he preferred that which is commonly pronounced the best, and which is rarely to be found, except dispersed, out of London — the distinguished men of science and literature of the day ; but rather than be long alone, he had no objection to common-place persons, especially if strangers, and he seldom failed to entertain them, and to leave on their minds a strong impression of talent. I remember hearing of two young officers who accidentally fell in with him on the river side when angling, and spending the evening with him at an adjoining inn, where they stopped for the night : they found their chance companion so singularly amusing, and such a very good fellow ; so copious in good stories ; so knowing in the art of angling and in all things relating to rivers and fish, and to the gun as well as to the rod, — that their curiosity was excited to inquire of the landlord who he was ; and their surprise was great on being informed that he was the President of the Royal Society. He carried

into company an animation and a desire to please, the exertion of which required considerable effort, and was consequently incompatible with a weak state of health ; and therefore when his health failed him, this was one of his motives for going abroad ; for he knew that if he remained at home it would be difficult to refrain from society entirely, and that if he indulged in it at all he should over-exert himself. I recollect an instance in point. Soon after we had arrived at Ravenna, and were established in the apartments which the Vice-Legate was so obliging as to offer us in his palace, he received a visit from Monsignor Spada Medici, and conversed with him with a degree of animation and energy that surprised and rather alarmed me. When the Vice-Legate had taken his leave, I spoke to him of the manner in which he had exerted himself, expressing uneasiness as to its effect on his health. This he did not deny ; yet at the same time he seemed to consider it as absolutely necessary that he should have so exerted himself. “ What ! ” he said, “ could I sit like a stock or a stone, instead of endeavouring to entertain my visitor ? ” He was fond of sustained conversation, and when warmed was apt to speak at some length, and to deliver his sentiments as they flowed sparkling from his fancy, and often with a rich profusion of imagery ; thus having an oratorical and poetical character, but always of a manly kind, and free from all puerilities and forced efforts at shining.

An idea has prevailed, I have been informed, that he was irritable, impatient, and violent of temper, and that latterly he was considered so, even by some persons who were well acquainted with him. His temper was always warm and ardent ; but during his

best days, I believe, it was very amiable ; he was easily pleased, and free from any morbid irritability ; and then he was unusually popular, and was surrounded with admiring acquaintances and kind friends. Latterly, owing to a variety of circumstances of annoyance, both of a public and private kind, especially from unreasonable persons in and about the Royal Society, his temper was more liable to be ruffled, and at the same time his declining health made him less able to bear such trials ; and it was under these circumstances that he may sometimes have given way to sallies of anger, which, however much provoked, ought to have been restrained.

He was convivial in his habits, and curious in the qualities of meats and wines ; yet in the latter he was temperate. He preferred the lighter kinds, the French, and very rarely indeed committed any excess in their use. Drunkenness he considered a disgusting condition, and I never saw him in it. If I recollect rightly, he told me he had been only once drunk, and that was when a very young man.

In dress he was rather careless, especially latterly ; consulting more health and comfort than fashion and appearance. Before the present undress of gentlemen came into vogue, after the termination of the war, short breeches, black silk stockings, a blue coat, and a white waistcoat, and white neckcloth,—the common costume of the time,—was his usual attire ; but he retained it no longer than it was common. He was fond of broad-brimmed hats, as they afforded protection from the sun and rain, and he generally wore one in travelling. I remember his wearing one of very moderate dimensions when he came to Edinburgh in 1811, soon after his marriage, at the time I

was studying there; and in walking through Princes-street it attracted the impertinent notice and remark of some young men who were following us. At that time there was so little intercourse with foreigners, and dress was so uniform, that any small innovation was considered a great peculiarity.

He sat several times, and to different artists, for his portrait. There are four which I have seen, and which I shall mention. The earliest, by Mr. Howard, from which the engraving prefixed to this work is taken, was done soon after he became professor of chemistry, when he was about twenty-three years of age. It is in the possession of his friend Mr. Poole. I shall here transcribe a portion of a letter from this gentleman to me, alluding to this picture, and which is very characteristic of his feelings towards my brother; written on the occasion of his receiving from me a copy of the "Consolations in Travel," which was dedicated to him: —

"Nether Stowey, Jan. 27. 1830.

"MY DEAR SIR,

"For I cannot in other terms address you, as the brother of my late dear and illustrious friend, Sir Humphry Davy, I beg you to accept my sincere thanks for the invaluable testimony of his regard which you have transmitted to me, and for your interesting and obliging note accompanying it. I need not say how much I feel honoured by his kind recollection of me, and by his making that feeling known to the world; nor how sensible I am of your attention, by mentioning in the preface the affecting circumstances under which the dedication was written.

I received the book last night. I have read it through with deep interest; and it will interest, and instruct, and excite to noble purposes all who read it. It is delightful to see his mind partaking so much of heaven when just on its threshold.

“ There is another gratification which I have experienced, to which I cannot help alluding; I mean my friend’s recollection of me by his will. I have received the legacy from Lady Davy, and have appropriated it to the purchase of his portrait by Howard. It is, I remember, a striking likeness of *what he was* seventeen years ago, and a good painting. I think myself very fortunate in being able to procure it. The picture is now on its way from London, and will be my companion while I live. Its presence will tend to make me wiser and better.

“ I cannot conclude without expressing a hope, that when any circumstance takes you *to the West*, you will favour me with a visit. I am but eight miles of excellent road from Bridgewater; and it will give me great satisfaction to become acquainted with the brother of *the friend* whom I honoured and loved, and whose death, for my own sake and for the sake of mankind, I lament.

“ I am, &c.

“ THOMAS POOLE.”

In point of time, the next portrait which was painted of him was a full-length, by the late Sir Thomas Lawrence. It was commenced in 1810 or 1811. It is a good specimen of the manner of this distinguished artist, and was generally considered as an excellent likeness. Lady Davy has presented it

to the Royal Society; and it is now suspended in the meeting-room of the Society, amongst the portraits of its illustrious Fellows.

The third portrait of him which I have to mention was by Mr. Lonsdale, in the dress and chair of the President of the Royal Society. It was a picture which pleased me; rather ideal, indeed, but full of character, and, as I thought, a most favourable likeness. I believe it was painted for his early friend, Mr. Thomson, of Clitheroe in Lancashire, a gentleman fond of chemical pursuits and chemists; portraits of the most distinguished of whom he has collected at a considerable expense. The last I shall notice was a small picture, by Mr. Jackson, done about 1823, and also in the dress of President. It is now in the possession of Lady Davy. As a picture, for richness and harmony of colouring it has merit, but I do not like it as a portrait: the likeness is not pleasing; it has not his best expression of countenance, and it is very deficient in a certain intellectual cast and aspiring look which belonged to him in his best moods of temper and thought. He, indeed, was a very difficult subject either for the pencil or chisel, and especially for the latter, owing to the mobility of his features, the varying expression of his eye and mouth, and the impossibility of fixing, either on the canvass or marble, the evanescent lights of mental feeling which broke out in his countenance when animated in conversation on subjects of interest.

Bacon says, "The best part of beauty is that which no picture can express." The saying is most true in relation to him. None of his portraits, in my opinion, thoroughly did him justice, or conveyed a

perfectly accurate idea of him, and much less the busts which were attempted. Of these I have seen only two; the one by Mr. Gibson at Rome, the other by Mr. Joseph; and both I consider failures. I believe he sat to Mr. Chauntry; but the work, if commenced, was never finished.

Of his character generally I shall introduce a sketch which I owe to the kindness of my brother's oldest and most attached friend, Mr. Poole, written in the form of a letter to Dr. Paris, who has made use of parts of it in his work; but not, as Mr. Poole assures me in a letter, of those parts which convey the "substance and spirit (to his satisfaction) of his own observations on his manners and social qualities."

"Nether Stowey, Feb. 1. 1830.

"DEAR SIR,

"You request me to give you any information in my power which may contribute to the important and interesting work which you have undertaken, — the History of the Life of my distinguished and lamented friend, the late Sir Humphry Davy.

"Although the most friendly intercourse existed between us for thirty years, and occasionally correspondence by letters, I fear I have little else to communicate than to bear testimony to his general intellectual elevation, and to the warmth, sincerity, and simplicity of his heart. I was first introduced to him at the Medical Pneumatic Institution at Clifton, in, I think, 1799, where I inhaled his nitrous oxide with the usual extraordinary and transitory sensations; but the interesting conversation, manners, and appearance of the youthful operator were not transitory;

may, riveted my attention, and we soon became friends.

“ From that time to his death, no interruption of the most cordial goodwill and affection occurred between us. Neither the importance of his discoveries, nor the attentions of the exalted in rank or science, whether as individuals or public bodies, nor the honour conferred on him by his sovereign, made the least alteration in his personal demeanor or in the tone of his correspondence. No man was ever less spoiled by the world. The truth is, though he conformed to the world, and paid due deference to those men and things which are deferred to by the world, his delight was in his intellectual being. He felt that he had the power of investigating the laws of nature beyond that entrusted to the generality of men; and the success with which he acted on this impulse increased his confidence. During his last visit to me, in November, 1827, when in a very weak state of health, he more than once said, ‘ I do not wish to live, as far as I am personally concerned; but I have views which I could develop, if it please God to save my life, which would be useful to science and to mankind.’ Indeed, to be useful to science and to mankind was that in which he *gloried*, to use a favourite word of his. He was enthusiastically attached to science, and to men of science; and his heart yearned to be useful to mankind, and particularly to the humblest of mankind. How often have I heard him express the satisfaction which the discovery of the safety lamp gave him! ‘ I value it,’ he said, ‘ more than anything I ever did: it was the result of a great deal of investigation and labour; but if my directions be attended to, it will save the

lives of thousands of poor men.' 'I was never more affected,' he added, 'than by a written address which I received from the working colliers when I was in the North, thanking me on behalf of themselves and their families for the preservation of their lives.' I remember how delighted he was when he showed me a service of plate presented to him by those very men and their employers, as a testimony of their gratitude.

"Such were the motives which excited him to that investigation which led to those various important and brilliant results which you are qualified to appreciate, and will, I doubt not, ably detail.

"However his circumstances or situation in society altered, his labours and zeal in the pursuit of science were throughout his life undiminished. Not many days before he had that attack of paralysis at Rome, from which he never recovered, he tells me in a letter that he was employed in the investigation of the generation of eels. Natural history in general had been a favourite subject with him throughout his protracted illness; for when he was with me in November, 1827, he paid attention to that subject only; 'for,' said he, 'I am prohibited from applying, and am indeed incapable of applying, to anything that requires severe attention.' During the same visit I remember his inherent love of the laboratory (if I may so speak) was manifested in a manner which much interested me at the moment. On his visiting with me a gentleman in this neighbourhood who had offered to let him his house, and who has an extensive philosophical apparatus, particularly complete in electricity and chemistry, he was fatigued by the journey; and as we were walking round the house

very languidly, a door opened, and we were in the laboratory. He threw his eyes round the room, which brightened in the action,—a glow came over his countenance, and he appeared himself twenty years ago. He was surprised and delighted, and seemed to say, ‘This is the beloved theatre of my glory.’ I said, ‘You are pleased.’ He shook his head and smiled. What from my earliest knowledge of my admirable friend I considered his most striking characteristic was the quickness and truth of his apprehension. It was a power of reasoning so rapid when applied to any subject, that he could hardly himself be conscious of the process; and it must, I think, have been felt by him, as it appeared to me, pure intuition. I used to say to him, ‘You understand me before I half understand myself.’ I recollect on our first acquaintance he knew little of the practice of agriculture. I was at that time a considerable farmer, and very fond of the occupation. During his visits in those days, I was at first something like his teacher in this matter; but my pupil soon became my master, both in theory and practice. No man was less a sectarian (if I may use the word), in religion, in politics, or in science. He regarded with benevolence the sincere convictions of any class on the subject of religion, however they might vary from his own. In politics he was the ardent friend of rational liberty; he gloried in the institutions of his country, and was anxious to see them maintained in their purity, by timely and temperate reform. Men of science, wherever situated, he considered as fellow-subjects of one great republic, spread over the world. I was in London soon after he received the letter from France, announcing that the National

Institute had awarded him the prize given by Napoleon to the greatest discovery by the means of galvanism. (These discoveries are detailed in the Transactions of the Royal Society, 1807.) He showed me the letter, and said, 'Some people say I ought not to accept this, and there have been foolish paragraphs in the papers to that effect; but if the two countries or governments are at war, the men of science are not,—that would indeed be a *civil war* of the worst sort.'—'Rather,' he added, 'we should, through the instrumentality of men of science, soften the asperity of national war.' Among my friend's intellectual efforts, his poetical productions are worthy of attention. Some have been published; and I believe there is a large collection in manuscript.

"If his mind had been given another direction, he, probably, would have ranked high among our poets. I recollect hearing perhaps the greatest living poetic genius say, 'Had not Davy been the first chemist, he, probably, would have been the first poet of his age.'* As to his amusements, he was latterly a good shot, and an expert angler,—a great admirer of old Isaac Walton. He highly prided himself on these accomplishments. I used to laugh at him, which he did not like; not that I under-rated them, but it amused me to see such a man give so much importance to these qualifications. He would say, 'It is not the sport only (though there is a great pleasure in successful dexterity); but it is the ardour of the pursuit,—the pure air,—the contemplation of a fine country,—the exercise,—all which invigorate the body, and excite the mind to its best efforts.'

* The late Mr. Coleridge.

“ He endeavoured, at different times, to purchase an estate in this neighbourhood, on which he proposed to reside occasionally ‘ for the sake,’ he said, ‘ of field sports in a fine country.’ These amusements seem to have become more and more important in his estimation as his health declined, and it was affecting to observe the efforts he made to share them as his strength diminished. From being able to walk without fatigue for many hours, he was, when he came to me, in November, 1826, obliged to have a pony to take him to the field, from which he dismounted only in the certainty of immediate sport. In the following year he could only take short occasional rides to the covers, with his dogs around him, and his servant walking by his side carrying his gun, but which, I believe, he never fired. During this last visit (November and December, 1827) his bodily infirmity was very great, and his sensibility was painfully alive on every occasion. Unhappily he had to sustain the affliction of the sudden death of Mr. K., the son of a friend whom he highly valued; and though this afflicting event was by the considerate attention of Lady Davy first communicated to me, to be imparted to him, with every precaution to avoid his being suddenly shocked, yet it was many days before he could resume his usual spirits, feeble as they were, and wonted occupation. On his arrival he said, ‘ Here I am, the ruin of what I was!’ But, nevertheless, the same activity and ardour of mind continued, though directed to different objects.

“ He employed himself three hours in the morning on his ‘ *Salmonia*,’ which he was then writing. He would then take a short walk (which he accomplished

with difficulty), or ride ; and after dinner I used to read to him some amusing book. We were much interested particularly by Southey's 'Life of Nelson.' 'It would give Southey,' he said, 'great pleasure if he knew how much his narrative affected us. In the evenings Mr. and Mrs. W. (he had long known W.) frequently came to make a rubber at whist. He was averse to seeing strangers ; but on being shown the drawings in natural history of a friend of mine of great talent, Mr. Baker of Bridgewater, he was anxious to see him, and was much pleased with his company, and suggested to him various matters for investigation concerning fish, particularly the eel. What pleasure would it give him, if he were now alive, to learn the interesting result of these suggestions, which will, I hope, soon be known to the public !

"I know not that I can add more to fulfil the object I proposed to myself, which was not to speak of Sir Humphry Davy's discoveries in science, his various literary productions, or his able and upright conduct as a member of public bodies ; these are before the public, and evince his greatness : but it was to show that he was not only one of the greatest but one of the most benevolent and amiable of men. The extracts from our correspondence, which follow these remarks, will elucidate the points of character which I have touched. It has been with this view that I have admitted some otherwise very trivial matter, and have included sentiments and the expression of feelings respecting myself, which, though I value as my best treasure, nothing but the wish to make him known as he was could induce me to submit to the public. You are at perfect liberty to select

from those extracts, and to shorten or disregard altogether this narrative.

“ I am, dear Sir, yours,

“ THOMAS POOLÈ.

“ *To Dr. Paris, Dover Street,
London.*”

I have now brought this work to a conclusion. It has been said by Mr. Babbage, in his “ Essay on the Decline of Science in England,” that we can expect eulogy only, not biography, from contemporary writers. His words are, referring to Dr. Wollaston and my brother, then recently dead, “ Until the warm feelings of surviving kindred and admiring friends shall be cold as the grave, from which remembrance vainly recalls their cherished forms invested with all the life and energy of recent existence, the volumes of their biography must be sealed; their contemporaries can expect only to read their *éloge*.” This opinion, so broadly and authoritatively promulgated, is neither consistent with experience, nor accordant with Mr. Babbage’s own sentiments as expressed in the preface to his book, in which he approves of Dr. Johnson’s opinion, “ that the famous maxim ‘ *de mortuis nihil nisi bonum,*’ appears to savour more of female weakness than of manly reason.” And that it is not consistent with experience, we have too many proofs in the calumnies which have been poured on the dead, the distinguished dead, by those who either entertained hostile feelings towards them while living, or who sold their pen to a party actuated by hostile feeling. Men at all times must necessarily write (supposing they are honest, and not under the in-

fluence of an unworthy bias) as they think and feel ; and consequently contemporary biography will be either indulgent and laudatory, or severe and censorious, according to the feelings and sentiments existing in the minds of the writers respecting the individual they describe. Consult, for instance, a Life of Luther or of Calvin, written by a Roman Catholic a few years after their decease, and another by a Protestant of the same period, — how totally different are the men represented !* These are extreme cases ; but in all other instances the motives are more or less similar, and the effect must correspond. The maxim “ *de mortuis nil nisi bonum,*” is, as it were, the generous sense of mankind on the manner in which the dead ought to be treated, and intended as a check on slander. Like everything else which is good, this maxim may be abused, especially when it produces merely “vague reports and barren eulogies.”† That a man is not free from human infirmities must always be taken for granted. To hold up the infirmities of a man of genius to observation is neither necessary nor useful ; on the contrary, injurious, as tending to lower him as an example in the minds of posterity, and diminish the influence of his name. Almost from the nature of biography, it appears to me that it *ought* to be laudatory. Who is competent

* Beza, the admiring biographer of the latter, thus concludes the history of his life perfectly in accordance with the above remark : “ *Ego historiam vitæ et obitus ipsius, cujus spectator sedecim annos fui, bonâ fide persecutus, testari mihi optimo jure posse videor, longe pulcherrimum vitæ Christianæ tum vitæ, tum mortis exemplum in hoc homine cunctis propositum fuisse, quod tam facile sit calumniari, quam difficile fuerit æmulari.*” (Joan. Calvini vita à Theod. Beza, Genevensis Ecclesiæ Ministro accurate Descripta. Hanoviæ, 1597.)

† Bacon.

to write the life of a contemporary, but one intimately acquainted with him? And who would undertake the labour from any but mercenary or other improper motives, excepting an admirer of him,—excepting, in brief, a friend? It is only the friend who is competent to the task; he who has enjoyed his intimacy and confidence; who knows not only his actions, but his views and principles; and has, as it were, had the advantage of being behind the scenes (so far as one human being can be to another) of the stage of life. My situation in relation to my brother, I am happy and proud to confess, has been very much this; otherwise I would not have attempted the present work. In writing it, I have had chiefly to regret that I have so often been under the necessity of vindicating his character, traduced by his contemporaries, and more especially by his biographer Dr. Paris, whose book is composed as if to offer an immediate refutation of the opinion of Mr. Babbage already referred to. The faults of a friend, the trifling faults,—those which are passed over in the estimate of living character, and which it would be difficult to record in friendly biography,—are like the shades of a picture, not detracting from, but brightening the whole. As shades, no one can duly appreciate their effect but he who is a thorough master of the subject, and to whom they may appear not the least admirable part of the painting; and so, perhaps, I am sometimes disposed to think (and it may be charitable to adopt the conclusion), that in human life what is considered as a shade (provided it is free from moral taint) may to superior intelligences appear rather as an excellence than defect, derived from some high principle, the detection of which has escaped common

observation, and which in the individual character has been productive of good.

One more tribute from a friend (now no more) I cannot refrain from having the satisfaction of inserting, more especially as he was acquainted with my brother almost as long as Mr. Poole; and being resident in London, and in the same circle of society, was always on terms of intimacy with him. I allude to the late Mr. Sotheby, one of the most amiable and respectable of men. In a little poem of his, written in 1833, in compliment to the living men of science of the time, he thus apostrophises his friend; I give only a part, that relating to his mind:—

“ Thou ! from whose lip the word that freely flowed
With all a poet's inspiration glowed,
Lamented friend, farewell ! Thou liest at rest,
A world of wonders buried in thy breast !
High aims were thine, — all nature to explore,
Make each new truth developed gender more,
And upward traced through universal laws
Ascend in spirit to the Eternal Cause.
Such was thy ardent hope, thy view sublime.
But ah ! cut off in manhood's daring prime,
Thou liest where genius leans upon thy tomb,
And, half eclipsed, mourns thy untimely doom.”*

* Lines suggested by the third meeting of the British Association for the Advancement of Science, held at Cambridge in June, 1833, By the late W. Sotheby, Esq., F.R.S.

INDEX.

- Acids**,—their action on the chlorate of potassa, noticed, i. 495.
Agricultural chemistry, elements of,—notice of, i. 340—358.
Alchemists,—character of, i. 369.
Alps, Austrian,—notice of, ii. 98.
Ammonia,—notice of experiments on salts of,—especially on the deliquescent carbonate, i. 111.
 ———, researches on, i. 399. **Amalgam** from, i. 400.
Analogies on,—“between the undecomposed substances, and on the constitution of acids, i. 497.
Atomic theory,—notice of, i. 439.
Attraction,—notice of hypothesis that chemical and electrical attraction depend on the same cause, i. 330.
Azote,—notice of a detonating compound of, i. 458.
Babington, Dr.,—notice of, ii. 284.
Bacon,—his philosophical character, i. 229.
Bakerian lecture,—“on some chemical agencies of electricity,” notice of, i. 330.
 ———, 2d. “On some new phenomena of chemical changes produced by electricity, particularly the decomposition of the fixed alkalies, i. 379.
Banks, Sir Joseph,—mention of, ii. 127.
Beddoes, Dr.,—description of, i. 61.
Berthollet,—mention of, i. 469.
Berzelius, M.,—brief notice of, ii. 216.
Boracic acid,—its decomposition described, i. 409.
Brownrigg, Lady,—anecdote from, respecting Sir H. Davy, i. 270.
Buddle, Mr.,—his testimony to the efficacy of the safety lamp, ii. 11. 15. 53. 54. 58.
Bennet, Mr.,—his electrical discoveries, i. 322.
Carbon, forms of,—researches on, i. 483.
Cardew, Rev. Dr.,—extract of a letter from, i. 20.
Cavendish, Mr.,—his philosophical character, i. 221.
Chemistry,—commencement of its study, i. 42.
Chemistry, agricultural,—definition of, i. 340.
Chlorine,—account of experiments in proof of its being undecomposed, i. 414.
Christian, Prince,—mention of, ii. 210.
Coal,—observations on the origin of, i. 243.

- Colours used by the ancients,—an account of experiments on, i. 495.
- Conducting power,—notice of electrical experiments on, ii. 147.
- “*Consolations in Travel*,” a posthumous work,—account of, ii. 369—385.
- Copper sheathing of ships,—notice of researches on its preservation, ii. 172.
- , examples of the success of protectors, ii. 185.
- Cornwall,—its state in the middle of the last century, i. 8.
- , geology of, i. 294.
- Coulson, Mr.,—his opinion of Sir H. Davy, i. 57.
- Crystals,—notice of experiments on fluids in their cavities, ii. 155.
- Cuvier, Baron,—mention of, i. 469.
- Dalton, Mr.,—remarks on his atomic hypothesis, i. 441.
- Dibdin, Rev. Dr.,—notice of Sir H. Davy’s illness in 1807.
- Du Fay,—his electrical discoveries, i. 314.
- Durham, Earl of,—address relative to the safety lamp, ii. 45.
- Earths, alkaline,—their metallic basis, discovery of, i. 395.
- , proper,—their bases, i. 396.
- Eel, generation of,—conjectures respecting, ii. 241.
- Electric fluid,—early speculations respecting, i. 72.
- Electrical science,—sketch of history of, i. 308—334.
- Electro-chemical action in the economy of nature, i. 359.
- Electro-magnetism,—notice of researches on, ii. 144.
- , description of peculiar phenomenon of, ii. 158.
- Electricity,—mention of experiments on, in connection with *nervomuscular* action, ii. 234.
- Element defined, i. 234.
- Elements of bodies,—opinions concerning, i. 408.
- of chemical philosophy,—notice of, i. 437—455.
- Essays on heat and light,—notice of, i. 68—84.
- Euchlorine,—discovery of, i. 417.
- Experimenting,—Sir H. Davy’s method of, i. 253.
- Explosions in mines,—notice of, ii. 3.
- Fire-damp,—notice of, ii. 4.
- Flame,—researches on, ii. 26. 31. 34.
- Fluoric combinations,—researches on, i. 418.
- Franklin, Dr.,—his electrical discoveries, i. 317.
- Friendship,—extract from essay on, i. 31.
- Galvani,—his discovery of a new animal electrometer, i. 322.
- Gases,—notices of the liquefaction of, ii. 160.
- Gauss, M.,—brief notice of, ii. 216.
- Gilbert, mention of, i. 309.
- , Extracts from his treatises *De Magnete* and from his *Philosophia nova*, i. 301.
- Glommen, river,—notice of, ii. 201.
- Grey, Stephen,—his electrical discoveries, i. 313.
- Gulval Carne,—inscription for, i. 18.
- Guyton de Morveau,—mention of, i. 468.

- Heat,—reflections on, i. 236.
- Heisenger and Berzelius,—their electro-chemical discoveries, i. 328.
- Higgins, Dr. Bryan, and Mr. Wma., their atomic views referred to, i. 443.
- Humboldt,—mention of, i. 469.
- Hydrogen,—conjecture of its metallic nature, i. 74.
- Ignition without inflammation,—particulars respecting, ii. 33.
- Illness,—particulars of Sir H. Davy's at Rome, ii. 348.
- Instincts of animals,—observations and reflections on, ii. 292.
- Iodine,—researches on, i. 464.
- , further researches on—note on its medicinal effects, i. 480.
- and oxygen,—a solid compound of, noticed, i. 495.
- Ireland, tour in,—fragments of a journal of, i. 274—284.
- Jenner, Dr.,—mention of a conversation with, ii. 389.
- Journey,—notices of, through France into Italy, ii. 222—229.
- from Rome to Geneva,—mention of, ii. 357—364.
- Journal of a Tour from Italy into Southern Austria, and from thence to England,—fragments of, ii. 247—282.
- Kleish, Von,—his discovery of the Leyden phial, i. 315.
- Klopstock,—mention of his tomb, ii. 212.
- Knight, Mr. Andrew,—his opinion of Sir Humphry Davy, i. 146.
- Laboratory of Royal Institution,—mention of, i. 253.
- Lamp, safety,—how discovered, ii. 6.
- , description of, ii. 7.
- , communications respecting, from practical men, ii. 11.
- La Place,—mention of, i. 470.
- Lecture, introductory for the courses of 1805, at the Royal Institution, i. 156.
- , introductory to the chemistry of nature, i. 169.
- , introductory geological, i. 182.
- , extracts from, i. 204.
- , on the progress of electrical science, i. 308.
- , extract from, on the decomposition of the fixed alkalies, i. 380.
- , on the cause of volcanoes, i. 397.
- Letter—*Vide* L. 2.
- Letter of Sir H. Davy to his mother,—extract from, i. 14.
- to the same, i. 65.
- to a young friend,—extract from, i. 104.
- to his mother, i. 105.
- to Mr. Tonkin, i. 107.
- to his mother, i. 132.
- to Mr. Poole, i. 140.
- to Mr. Clayfield, i. 140.
- to the same, i. 143.
- to Mr. Purkis, i. 144.
- to his youngest sister, i. 145.
- to Mr. Underwood, i. 148.
- to his mother, i. 151.

- Letter of Sir H. Davy to the same, i. 267.
 _____ to the same, i. 268.
 _____ to Sir Thomas Bernard, i. 272.
 _____ to Mr. Poole — extract from, i. 292.
 _____ to the same, i. 293.
 _____ to his mother, i. 429.
 _____ to his brother, i. 431.
 _____ to his mother, i. 433.
 _____ to his brother, i. 433.
 _____ to the same, i. 434.
 _____ to the same, i. 457.
 _____ to the same, i. 459.
 _____ to his mother, i. 460.
 _____ to the same, i. 463.
 _____ to his brother, i. 481.
 _____ to his mother, i. 501.
 _____ to the same, i. 507.
 _____ of Mr. Buddle to Sir H. Davy, — extract from, ii. 2.
 _____ of Mr. Peile to the same, — extract from, ii. 18.
 _____ of Mr. John Morris to John Simmons, Esq., ii. 20.
 _____ of Sir H. Davy to the Earl of Durham, ii. 42.
 _____ of Mr. Buddle to Sir Cuthbert Sharp, ii. 53.
 _____ to Dr. Davy, ii. 54.
 _____ to the same, ii. 58.
 _____ of Sir H. Davy to his mother, ii. 63.
 _____ to the same, ii. 97.
 _____ to his brother, ii. 139.
 _____ to the same, ii. 140.
 _____ to the same, ii. 142.
 _____ to his mother, ii. 145.
 _____ to Mr. Poole, ii. 154.
 _____ to his brother, ii. 156.
 _____ to Mr. Edmund Davy, ii. 165.
 _____ to his brother, ii. 166.
 _____ to the same, ii. 175.
 _____ to his mother, ii. 188.
 _____ to his eldest sister, ii. 219.
 _____ to Mr. Poole, ii. 228.
 _____ to Mr. Gilbert, ii. 264.
 _____ to his brother, ii. 309.
 _____ to the same, ii. 310.
 _____ to the same, ii. 330.
 _____ to the same, ii. 335.
 _____ to the same, ii. 336.
 _____ to the same, ii. 337.
 _____ to Mr. Poole, ii. 339.
 _____ to his brother, ii. 345.
 _____ to his brother, ii. 346.
 _____ to Mr. Coleridge, ii. 391.

- Letter of Sir H. Davy to the same, ii. 393.
 — of Mr. Poole to Dr. Davy, ii. 399.
 — to Dr. Paris, ii. 402.
 Light,—observations on, as a chemical agent, i. 448.
 Lime,—note on its use in agriculture, i. 352.
 Magnetism,—hints for experiments on, ii. 233.
 Manures, fossil,—explanation of use, i. 352.
 Manures,—rule relative to use of, i. 349.
 MSS., Herculaneum,—notice of, and of experiments to unrol, ii. 118.
 Materialism,—reasoning in favour of, i. 25.
 — against, i. 26.
 Metaphysical studies,—mention of, i. 38.
 Mists,—some particulars respecting, ii. 100.
 Monuments, public,—appeal in favour of, i. 212.
 “Moses,”—plan and fragments of a poem so called, i. 124—129.
 Mount St. Michael’s,—notice of, i. 17.
 Muriatic acid,—researches on, i. 412.
 Museum, British,—remarks on, ii. 342.
 Newton,—remarks on, i. 231.
 — further mention of, i. 313.
 Nicholson and Carlisle,—their electro-chemical discovery of the decomposition of water, i. 327.
 Nitrous oxide,—experiments on breathing, i. 94—101.
 Nomenclature, chemical,—remarks on, i. 451.
 Norway,—extracts of a journal respecting, ii. 191.
 Note books,—extracts from, i. 22. 38. 57. 90. 112. 369.
 —, further extracts from, ii. 64.
 “O’Donaghues, the last of the ;” an Irish story, ii. 314—330.
 Ørsted,—mention of his great discovery, ii. 143.
 —, brief notice of, ii. 216.
 Ombre chevalier,—particulars respecting, ii. 235.
 Oxygen,—reflections on, i. 238.
 Penzance,—state of, and changes in, i. 11.
 Perugia,—notice of scenery near, i. 486.
 Phosgene,—discovery of, noticed, i. 417.
 Pietra Mala,—notice of a natural coal gas flame at, i. 494.
 Playfair, Mr.,—his remarks on the safety lamp, ii. 22.
 Pliny,—remarks on, i. 228.
 Pneumatic Institution,—notice of, i. 60.
 Poetry : —
 “Sons of Genius,” i. 34.
 “The Tempest ;” an extract from, i. 40.
 “Lines to Mrs. Beddoes,” i. 62.
 “Lines on the Infant Daughter of Dr. and Mrs. Beddoes,” i. 63.
 “Lines, supposed to be written on visiting home,” i. 110.
 “Moses,”—plan and fragments of a poem so called, i. 124—129.
 “Lines written in the Coach, Dec. 1803, passing from Bath to Clifton,” i. 301.

Poetry (*continued*):—

- "On Mucriah and Anafil," i. 302.
 "On Fairhead," i. 303.
 "To Ashura," i. 368.
 "To a young Lady on her Birth-day," i. 364.
 "Written after Recovery from a dangerous illness," i. 390.
 "Fontainebleau," i. 472.
 "Mont Blanc," i. 473.
 "Banks of the Rhone," i. 473.
 "The Mediterranean Pine," i. 474.
 "The Canigou," i. 475.
 "Vaucluse," i. 477.
 "Carrara," i. 478.
 "Canova," i. 488.
 "The Sybil's Temple," i. 489.
 "On a distant View of Paestum," i. 490.
 "On the Immortality of the Mind," ii. 95.
 "To the Fire-flies," ii. 114.
 Poetical fragments, written at the Baths of Lucca, ii. 115.
 "The Eagles," ii. 157.
 "Lord Byron," written whilst living, ii. 168.
 "On the death of Lord Byron," ii. 168.
 Lines "On Ashburnham Place," ii. 169.
 Lines, written at Copenhagen, 215.
 Fragments, dated Ulswater, ii. 217.
 ——— Ravenna, ii. 250.
 "On the Fall of the Traun," ii. 260.
 Poles, — notice of, ii. 99.
 Political reflections, ii. 82.
 Poole, Mr., his account of Sir H. Davy, ii. 403.
 Potash and soda, — their discovery, i. 382.
 Priestley, — his philosophical character, i. 223.
 Puffin, Mr., — his mention of Sir H. Davy's early lectures, i. 137.
 Religion, — early reflections on, i. 27.
 ——— Christianity compared with other religions, i. 366.
 ——— speculations on, ii. 76.
 ——— reflections on, ii. 89.
 Report of Select Committee of the House of Commons, — extract from, respecting safety lamp, ii. 60.
 "Researches, Chemical and Philosophical, chiefly concerning Nitrous Oxide and its Respiration," — notice of, i. 93—111.
 Rome, scenery in the neighbourhood of, — noticed, ii. 354.
 Rocks, primary, — reflections on their origin, i. 240.
 ——— secondary, — remarks on their origin, i. 241—244.
 "Salmonia, or Days of Fly Fishing," — remarks on, ii. 287.
 ———, extracts from, ii. 288.
 Science, experimental, — some of its advantages, i. 208.
 ——— influence on the female character, i. 210.
 ——— doctrines of, — remarks on, i. 213.

- Science, enigmas of, — remarks on, i. 216.
 Scheele, — his philosophical character, i. 226.
 Shakspeare compared with Milton, i. 371.
 Silix, — experiments on the silix of the epidermis of certain plants, i. 85.
 Snipe, solitary, (*Scolopax rectivoluta*, Linn.) — notices of, ii. 237.
 Society, Royal, — extracts of address to, ii. 128.
 ———, note respecting, ii. 136.
 Somma, — notice of, i. 503.
 Sotheby, Mr., — lines on Sir H. Davy, ii. 412.
 Southey, Mr., — relation of anecdote by, i. 56.
 Speckbacker, — anecdote by Sir Walter Scott respecting, i. 507.
 Studies, — proposed plan of, i. 22.
 Sulphur, — results of experiments on, i. 408.
 Superstition, — note respecting, i. 149.
 Swallows, — conjecture respecting their low and high flight in connection with weather, ii. 244.
 Tanning, — experiments on, mention of, i. 336.
 Torpedo, — extracts from Sir H. Davy's paper on, ii. 333.
 Tomb, — Inscription on Sir H. Davy's, ii. 367.
 Tyrol, — extracts from journal in, i. 492.
 Underwood, Mr., — mention of, i. 147.
 Vacuum, — notice of experiments on, in relation to imponderable substances, ii. 150.
 Vauquelin, — mention of, i. 468.
 Vegetation, — effect of on the atmosphere, i. 77.
 Volcanoes, — hypothesis respecting, i. 397.
 ——— notice of researches on, ii. 122.
 Volta, — his great electrical discovery the foundation of a new science, i. 323.
 ——— mention of, i. 491.
 Voltaic battery of 2000 double plates, — effects of, noticed, i. 446.
 Von Kleish, — his discovery of the Leyden phial, i. 315.
 Walsh, Mr., — his discovery of the electricity of the torpedo, i. 320.
 Watt, Mr. Gregory, — notice of, i. 45.
 ———, letter respecting his death, i. 142.
 Wherry mine, — mention of, i. 45.
 Wollaston, Dr., — notice of, i. 258.
 Young, Dr. Thomas, — notice of, ii. 365.

THE END.

ERRATA.

VOL. I.

- Page 236. line 13. for "Benthollet" read "Berthollet."
338. line 16. for "country" read "county."
339. line 23. for "improvin" read "improving."
419. line 1. from bottom, for "ilicated" read "silicated."

VOL. II.

16. line 11. for "curre" read "current."
59. foot note, for "Reports" read "Report."
79. line 8. for "course" read "cause."
111. line 12. for "melsh" read "Welsh."
142. line 3. of note, for "ratiore" read "ratione."
182. line 14. after "above" omit the comma.
214. line 10. for "on" read "in."

